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THE

TRANSACTIONS

OF THE

PROVINCIAL

MEDICAL AND SURGICAL

ASSOCIATION.

PROPERTY OF THE WORCESTER DISTRICT MEDICAL SOCIETY.

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PROCEEDINGS

AT THE

ELEVENTH ANNIVERSARY MEETING

OF THE

PROVINCIAL

MEDICAL AND SURGICAL ASSOCIATION,

HELD AT LEEDS.

The eleventh anniversary of the Association was held on Wednesday and Thursday, the 2nd and 3rd of August, at Leeds. At eleven o'clock in the morning of the first-mentioned day, a meeting of the council took place at the School of Medicine, Mr. James, the President, in the chair, at which the routine business to be transacted at the general meeting was arranged and determined upon.

The First General Meeting commenced at one o'clock, in the Hall of the Philosophical and Literary Society; of those present, the following gentlemen had entered their names and residences on the visitor's book:—

Charles Chadwick, M.D., Leeds; George Norman, Bath; R. G. Horton, Leeds; William Hay, Leeds; J. Williamson, M.D., Chester; Thomas Poyser, Wirksworth; F. Sibson, Nottingham; W. M. Wilson, Horsforth; J. Thurnam, M.D., York; T. G. Wright, M.D., Wakefield; B. R. Morris, M.D., York; H. Keyworth, York; J. Macfarlane, Leeds; Thomas Rayner, Birstal; James Ashton, Stockport; E. J. Shearman,

M.D., Rotherham; R. Martland, M.D., Blackburn; G. Woollam, M.D., Mexborough; Samuel Hey, Leeds; T. P. Teale, Leeds; J. Muscroft, Pontefract; J. Hill, Knottingley; C. Cowan, M.D., Reading; R. Hindle, M.B., Blackburn; W. J. Wilson, Manchester; J. Fox Oxley, Doncaster; G. E. Bearpark, Leeds; R. P. Sleight, Hull; H. Russell, York; G. R. Robson, Knaresborough; H. Bell, M.D., Leeds; J. Bell, Nova Scotia; J. Ward, Leeds; J. T. Porter, Sheffield; J. S. Alderson, York; T. Parry, Harrogate; G. Smith, Harewood; T. Workman, Basingstoke; W. Bywater, Knottingley; W C. Russell, Bawtry; G. Anderson, M.D., (17th Lancers), Sheffield; T. Turner, Manchester; Charles Hastings, M.D., Worcester; J. H. James, Exeter; J. S. Soden, Bath; T. Shapter, M.D., Exeter; J. B Estlin, Bristol; James Crang, Timsbury; F. Flower, Chilcompton; W. Price, Leeds; R. S. Fielding, Riccall; W. Conolly, M.D., Cheltenham; J. Conolly, M.D., Hanwell; R. S. Hopper, M.D., Leeds; William Hey, Leeds; T. Martin, Reigate; A. Hardwick, M.D., Kensington; J. C. Smart, M.D., Leeds; E. Lankester, M.D., London; M. S. Kenny, M.D., Halifax; T. Nunneley, Leeds; P. F. Luard, M.D., Warwick; G. Goldie, M.D., York; William Newnham, Farnham; S. Staniland, Leeds; T. Smith, M.D., Leeds; O. Brooke. jun., Leeds; E. Holme, M.D., Manchester; Joseph Jordan, Manchester; W. R. Cass, Leeds; W. J. Lunn, Hull; Henry Hemingway, Dewsbury; T. Jeffreys, M.D., Liverpool; S. Radcliffe, Leeds; J. Jeffreys, London; J. M. Taylor, Holbeck, Leeds; J. A. Illingworth, Bradford; Frederick Salmon, London; J. W. Roberts, Bradford; G. H. L. Rickards, Armley; J. Douglas, Bradford; F. Sharpe, Leeds; W. Macturk, M.D., Bradford; J. Inglis, M.D., Halifax; W. Bampfield, (surgeon 32nd Infantry), Leeds; J. Toogood, Bridgwater; W. England, M.D., Wisbeach; M. Hall, Wortley; S. Flood, Leeds; W. Daunt, M.D., (6th Dragoons), Leeds; George Brunton, York; J. P. Garlick, Leeds; C. F. Brown, Leeds; Joseph B. Whiting, Lynn; W. Braithwaite, Leeds; William H. Eddie, Barton; William Hey, jun., Leeds; John Churchill,

London; Evan Evans, Leeds; William Marsden, Skipton; John Walker, Manchester; G. A. Chaytor, M.D., Manchester; George Morley, Leeds; S. Hare, London; S. Smith, Leeds; Thomas Hornby, Barmby Moor, Pocklington; R. Pullan, Hunslet, Leeds; A. Robertson, M.D., Northampton; R. S. Mayne, M.D., Leeds; G. P. Smith, M.D., Leeds; J. Ingham Ikin, Leeds; J. Cardew, M.D., Bath; Benjamin W. Micklethwaite, Gomersal; R. M. Hiddleston, Leeds; W. Johnstone, Bramley, Leeds; Tom Guy, M.D., Thorne; J. P. Payne, Loxley, near Sheffield; Henry Payne, Loxley, near Sheffield; T. Simpson, M.D, York; E. T. Allen, York; F. Marchant, M.D., Hemsworth, near Pontefract; A. Jubb, Halifax; G. Kennion, M.D., Harrogate; E. Charlton, M.D., Newcastle-on-Tyne; G. Brown, York; Caleb Williams, York; H. H. Broughton, Dobcross; F. Branson, M.D., Sheffield; H. R. Oswald, Douglas, Isle of Man; William Birtwhistle, Skipton; Thomas Beaumont, Bradford; William Hardman, Eckington, Chesterfield; Matthew Jackson, Market Weighton; Joseph Hodgson, Birmingham; W. H. Swallow, Halifax; John Robinson, Ripponden; Thomas Robertshaw, Sowerby Bridge; — Crook, M.D., London; W. W. Wiseman, Ossett; C. F. Favell, M.D., Sheffield; H. Thomas, Sheffield; Thomas Wainwright, Barnsley; Christopher Powell, Knaresborough; H. S. Belcombe, M.D., York; Henry Illingworth, Bradford; J. Outhwaite, M.D., Bradford; Robert J. N. Streeten, M.D., Worcester; W. D. Husband, York; E. Barlow, M.D., Bath.

Mr. James, the President, was called to the chair, which, after a short address, he resigned to his successor.

William Hey, Esq., then took the chair, and having addressed the meeting,* called upon the Secretary to read the report of the council.†

The Report of the Council having been read by Dr. Hastings—

Moved by Dr. Kenny, and seconded by Mr. Salmon—"That the report now read be adopted and printed."

* *Vide Provincial Medical Journal,* August 5, 1843, p. 364.

† *Ibid,* p. 367.

Moved by Mr. Newnham, and seconded by Dr. Jeffreys—"That the thanks of the meeting be given to our late President, Mr. James, of Exeter."

Moved by Dr. Goldie, and seconded by Dr. Conolly—"That the thanks of this meeting be given to the Secretaries of the Association, Dr. Hastings and Mr. Sheppard, for their services during the past year."

The Chairman read a letter from Mr. Sheppard, in which he announced his intention of retiring from the office of Secretary.*

Mr. Soden, of Bath, withdrew his motion—"That parties in arrear should be published as a separate list," in consequence of many having paid up their arrears during the past year.

Moved by Mr. Soden, and seconded by Mr. Newnham—"That the second law of the Association be amended, by substituting the words 'one or more,' in the place of the word 'two;' and that Dr. Streeten be appointed Secretary, at a salary of 100 guineas a-year."

Moved by Dr. Conolly, and seconded by Dr. Forbes—"That a permanent President be appointed to the council, who shall also act as Treasurer, and that Dr. Hastings be requested to accept the office of President to the Council."

Moved by Mr. Hall, and seconded by Mr. Sibson—"That the thanks of this meeting be given to the council of the past year, and that they be requested to continue their services, with the following additional members, and that they be empowered to add to their number:—W. B. Dighton, Esq., Northallerton; F. Earl, M.D., Ripon; M. Jackson, Esq., Market Weighton; J. Muscroft, Esq., Pontefract; E. J. Shearman, M.D., Rotherham; J. Outhwaite, M.D., Bradford; F. E. Headlam, M.D., Newcastle on-Tyne; Sir John Fife, Newcastle-on-Tyne; J. Dickinson, M. D., Liverpool; C. Wightman, M.D., Newcastle-on-Tyne; W. Bainbrigge, Esq., Liverpool; J. Inglis, M.D., Halifax; C. F. Favell, M.D., Sheffield; C. Thomson, M.D., Sheffield; H. Thomas, Esq., Sheffield; F. Branson, M.D., Sheffield; H. Dunn, Esq.,

* *Vide Provincial Medical Journal*, August 5, 1843, p. 371.

Wakefield; T. G. Wright, M.D., Wakefield; A. Jubb, Esq., Halifax; M. S. Kenny, M.D., Halifax; W. Marsden, Esq., Skipton; T. Rayner, Esq., Birstall; H. Hemingway, Esq., Dewsbury; E. Scholfield, M.D., Doncaster; J. Crang, Esq., Timsbury; J. C. Cookworthy, M.D., Plymouth."

Moved by Dr. Barlow, and seconded by Dr. Conolly—"That the central council be empowered to act on behalf and in the name of the Association, in all matters connected with medical reform, for the ensuing year, and that on all points on which they may deem peculiar consideration requisite, they be requested to seek counsel, as their discretion may direct, from the following members:—Sir James Clark, Bart.; John Forbes, M.D.; Charles Carter, Esq.; Thomas Martin, Esq.; R. Carmichael, Esq.; and the Vice-Presidents."

Cases and Papers were read by Mr. Nunneley, of Leeds, and Mr. T. P. Teale, of Leeds.

The Second General Meeting was held the same evening, at eight o'clock, W. Hey, Esq., the President, in the chair.

Moved by Dr. Williamson, and seconded by Dr. Robertson—"That, considering the incalculable importance of those interests which are involved, both public and professional, in the great question of medical reform, and the peculiarly critical circumstances in which that question is at present placed, a deputation of members of this Association be now appointed to obtain, without delay, an interview with her Majesty's Government, in order to explain those sound principles of medical legislation which they believe will alone be satisfactory to the profession and conducive to the welfare of all classes of her Majesty's subjects."

Dr. Conolly read the report of the Benevolent Fund.*

Moved by Mr. Newnham, and seconded by Mr. W. Hey, jun.—"That the report of the Benevolent Committee be received and adopted, and that the thanks of this meeting be given to them for the exertions they have made to increase the funds of this important branch of the Association."

* *Vide Provincial Medical Journal,* August 5, 1843, p. 373.

Mr. W. Hey, jun., read the Retrospective Address on Surgery.

Moved by Mr. James, and seconded by Mr. Estlin—"That the thanks of this meeting be given to Mr. W. Hey for his eloquent and able Address on Surgery, and that he be requested to allow the same to be printed in the next volume of the *Transactions* of the Association."

Moved by Dr. Simpson, and seconded by Mr. Turner—"That Dr. Cowan be requested to deliver the Retrospective Address on Medicine at the anniversary meeting of 1844."

The Third General Meeting was held at twelve o'clock on Thursday, W. Hey, Esq., in the chair.

Moved by Dr. Williamson, and seconded by Mr. Flower—"That Dr. Riley, of Bristol, be requested to deliver the Retrospective Address on Anatomy and Physiology at the anniversary meeting of 1844."

Dr. Shapter read the Retrospective Address on Medicine.

Moved by Dr. Jeffreys, and seconded by Mr. Hodgson—"That the thanks of the meeting be given to Dr. Shapter for his excellent and acceptable address, and that he be requested to publish the same in the next volume of the Society's *Transactions*."

Moved by Dr. Williamson, and seconded by Mr. Hall—"That the following gentlemen be constituted the deputation to wait upon Government on the subject of medical reform:—Mr. Hey, Mr. James, Dr. Robertson, Dr. Hastings, Mr. Martin, Dr. Hardwick, Dr. Conolly (Hanwell), Dr. Conolly (Cheltenham), Mr. Wickham, Mr. Toogood, Mr. Nunneley, Mr. W. Hey, Mr. Turner, Dr. Hopper, Dr. Favell, Dr. Williamson, Mr. Norman, Mr. T. P. Teale, Dr. Simpson, Mr. Husband, Mr. Jackson, Mr. Workman, Dr. Jeffreys, Mr. Estlin, and Mr. Crang."

Moved by Dr. Williamson, and seconded by Mr. Garlick—"That it be an instruction to the central council to appoint a deputation to wait on Government, if it appear to them expedient, at any time before the next general meeting, and that the councils of the several district bodies be requested to send delegates to meet the deputation in London."

Moved by Mr. Martin, and seconded by Dr. Hardwick—"That the anniversary meeting for the year 1844, take place at Northampton, and that Archibald Robertson, M.D., be appointed President-elect."

Moved by Dr. Chadwick, and seconded by Dr. Branson—"That the thanks of this meeting be given to Dr. Green and Dr. Streeten, for the liberal arrangements made by them for the supply of the *Provincial Medical Journal* to the members of the Association."

Cases and Papers were read by Mr. James, Mr. Estlin, Mr. Alderson, Mr. Sibson, Mr. Newnham, Mr. Casson, Dr. Davis, and Mr. Addison.

Moved by Dr. Favell, and seconded by Dr. Robertson—"That the thanks of this meeting are due, and are hereby given, to those gentlemen who have read cases and presented communications to this meeting."

Moved by Dr. Lankester, and seconded by Mr Jackson—"That the thanks of this meeting be given to the Leeds School of Medicine, and to the Council of the Philosophical and Literary Society, for the liberal use of their apartments for holding the meetings of the Association."

This concluded the business of the meeting, and Mr. Hey vacated the chair, when it was

Moved by Dr. Hastings, and seconded by Dr. Jeffreys—"That the thanks of this meeting are justly due, and that they be given, to the worthy President, Mr. Hey, for his unwearied attention to the duties of his office during the sittings of the Association at this anniversary meeting."

PART I.

ARTICLE I.

THE RETROSPECTIVE ADDRESS,

DELIVERED AT THE

ELEVENTH ANNIVERSARY MEETING

OF THE

PROVINCIAL MEDICAL AND SURGICAL ASSOCIATION,

HELD AT LEEDS, AUGUST 2nd and 3rd, 1843.

BY THOMAS SHAPTER, M.D.,

Physician to the Dispensary, Exeter.

The ardent zeal and indefatigable industry, which have of late years characterised the labourers in the several departments of Medical Science, have not flagged nor lost aught of their intensity during the past twelvemonth, and the result has been a mass of information which involves in considerable difficulty the composition of such a digest of its purports, bearing, and utility, as it has been the pleasure of this Association I should now lay before them.

In carrying out this object I fear that some important matters may have been omitted; that, in the anxiety to avoid this error, much that may appear vapid and useless is made to occupy your attention; or that, through misapprehension, the views and opinions of others may not be accurately stated.

Though it may be my desire, in thus pointing out these sources of difficulty, to deprecate any too severe criticism, yet nothing is further from my purpose than to waste the short and valuable time allotted to our meeting in vain and profitless apologies. I shall, therefore, at once commence my task, with the brief observation, that though the labours of the year may not be characterised by any very prominent improvements, or the development of any very novel and striking views, yet they will be found to offer for your consideration many points of considerable value and interest.

In compliance with the practice of my predecessors I shall commence with that division of my subject which embraces the progress of the sciences of anatomy and physiology.

ANATOMY AND PHYSIOLOGY.

Heart.—It may be supposed that much addition to our knowledge of the normal anatomy of the heart is not to be expected in the present day. Dr. Ranking* has, however, submitted this organ to a series of measurements, from which some interesting inferences are deduced; without going into any very particular detail, it may be stated that he arrives at the following conclusions:—

* *Medical Gazette*, No. xxiv., 1842.

1st. That the male heart is larger in all its proportions than that of the female.

2nd. That the length of a healthy heart to its circumference should be rather less than 1 to 2.

3rd. That the thickness of the right ventricular parietes is to those of the left nearly as 1 to 3.

4th. That the pulmonary artery is slightly wider than the aorta.

5th. That the right auriculo-ventricular orifice is considerably larger than the left, amounting to nearly an inch in both sexes.

Arteries.—Mr. Paget* has instituted a series of observations in order to prove the relative sizes of the trunks and branches of the arteries. It may be recollected that Mr. Ferneley† some few years since stated, contrary to the ordinarily received opinion, that the joint areas of sections of branches are, in general, equal to the area of the trunk. Mr. Paget shows, however, that there is not one constant relation of size between arterial trunks and branches; that in some cases the area of a transverse section of the trunk is less, in others more, than the sum of the areas of sections of its branches; but that for similar arteries in different persons the same relation for the most part holds good. Speaking generally, however, the old idea of the enlargement of the arterial canals, as trunks divide into branches, is the true one; though the enlargement is less than had been supposed. A constant exception to this rule is offered by the common iliacs, which are themselves

* *Medical Gazette*, July, 1842.

† *Ibid*, December, 1839.

smaller in their area than either that portion of the aorta whence they proceed, or the sum of the areas of the arteries proceeding from them; so that the stream is always contracted at these points.

The perfection with which, in every case that can be understood, the minutest arrangements of the body are adapted to a purpose, permits no doubt that these relations of size in the several parts of the arterial canal serve some particular end, and the one now alluded to deserves notice. The effect of such an arrangement must be to increase the velocity of the current, not only in the iliac arteries themselves, but in the arteries given off from the trunk above them, such as the mesenteric and renal; and it is surely not improbable that the acceleration of the circulation through the kidneys, and through the organs from which the roots of the portal veins are derived, is the special purpose which so singular an arrangement serves.

With regard to the properties of arteries, an anonymous writer* contends that elasticity is characteristic of the large arteries, and contractility of the small, and that the respective structure of these vessels confirms such a conclusion; for that, according to Henle, the inner portion of the external coat consists of pure elastic tissue, forming a layer of considerable thickness in the large arteries, which diminishes in direct proportion to their size, while the middle or contractile coat increases relatively in size as the arteries decrease in calibre; and that this view is moreover supported by the functions required of these several portions of the arterial system, as

* *Medical Times*, November 26, 1842.

well as by the observations of Berzelius, Nysten, Bichat, Wedemeyer, and Müller, who failed by the most powerful means to excite contractility in the larger arteries, while the experiments of Hales and Wedemeyer prove its existence to a great extent in the smaller ones.

The elaborate experiments on the functions of the capillaries, which have been made from time to time by Hales, Magendie, Carson, Arnott, &c., have been severely reviewed by Dr. Calvert Holland,* who asserts that they are too fallacious to ground any satisfactory conclusions upon, and cannot be adduced as proof of the direct action of the heart on the venous column; and further, that their several views are not supported by the natural conditions of the vessels of the circulation.

Pulse.—A variety of opinions have been entertained with regard to the relative frequency of the pulse at different periods of the day. The oldest and most prevailing of these is, that the pulse is slower in the morning than in the evening. From a series of observations which Dr. Stratton† has made, it appears that this view is erroneous, and that the pulse is really, in six mornings out of seven, quicker than in the evenings.

Blood Corpuscles.—In the retrospect of my predecessor the labours of the more recent microscopical observers, on the nature and mode of production of the blood corpuscle, were duly set forth. The in-

* *Edinburgh Medical and Surgical Journal*, April, 1843.
† *Ibid*, January, 1843.

vestigations of Dr. Martin Barry, Gerber, Remak, Quekett, Young, Gulliver, &c., from their novelty and importance, more especially engaged attention. During the past year, however, further observations have been made, and we shall devote a few pages to the consideration of them.

The *red corpuscle* is now for the most part allowed to be a primary nucleated cell, circular in form, flattened on its surface, and rounded at its edges, and having a diameter ranging from about $\frac{1}{3,500}$ of an inch to $\frac{1}{4,000}$ of an inch. Mr. Addison,* however, states their average size at $\frac{1}{2,800}$ of an inch.

Mr. Wharton Jones, in a paper read before the Royal Society, December 8, 1842, mainly with the view of combating some of the statements of Dr. Martin Barry, says that the red corpuscle consists of a vesicle or cell, with thick walls, but in a collapsed and flattened state, and having therefore a bi-concave form, and, in consequence of its thick wall being doubled on itself, presenting under the microscope a broad circumferential ring, which is illumined or shaded differently from the depressed central portion, according to the focal adjustment of the instrument.

The account of Mr. Addison, though in some respects similar to that of Mr. Jones, differs entirely as to the origin of the diversities of shade in the ring and centre of the corpuscle. He concludes that these appearances are due to the fact of the corpuscle consisting of two elastic vesicles, one within the other; he infers this to be the case because the blood corpuscles (and we assume his observations applicable to the red corpuscle) exhibit when under

* *Transactions of the Provincial Medical & Surgical Association*, vol. xi.

the microscope an appearance of two circles, one within another. The area of the inner circle is sometimes seen lighter, sometimes darker, than that of the outer; and sometimes the shading of the two circles causes the corpuscles to appear as if they were slightly hollowed out from the circumference towards the centre. The most conclusive evidence that Mr. Addison offers, however, of there being two circles is, that when the corpuscles are crowded together they become elongated and compressed into various shapes, and the outline or figure of the inner circle is equally affected with that of the outer one; but the matter of the two circles is never seen to mingle, and when the pressure is removed both of them regain their pristine form.

Dr. Griffith * and Mr. W. Jones † have both objected to the statement of Dr. M. Barry, that there exists in the corpuscle a primordial fibre. The former thinks that the appearance, which he believes to have deceived Dr. Barry, is in all cases produced after the vitality of the blood is destroyed, and is dependent on physical causes alone for its production. He believes that the sac is generally cracked at the time of the production of the fibre, and the contents coagulated either by causes producing the ordinary coagulation of the blood or by the imbibition of a portion of corrosive sublimate when that is used; and the latter (Mr. W. Jones) says that the beaded aspect presented by the double *contour* of the thick wall of the red corpuscle, when it has been acted upon, either by mechanical causes

* *Annals of Natural History*, February, 1843, p. 99.

† *Transactions of the Royal Society*, December 8, 1842.

or by chemical reagents, of which the effect is to corrugate the edge and to bend it alternately in opposite directions, has, in the opinion of the author, given rise to the illusive appearance of an internal annular fibre. The appearance of flask-like vesicles presented by some of the red corpuscles, with Dr. Barry's alleged fibre protruding from their neck, Mr. Jones ascribes altogether to the effects of decomposition, which has altered the mechanical properties of the corpuscle, and allowed it to be drawn out, like any other viscid matter, into a thread. On the other hand, Dr. Willshire* endeavours to show some analogy between this primordial filament of Dr. Barry and a dark line observed by him on the starch molecule; and Dr. Carpenter, whose opinion as a practised microscopist deserves attention, affirms that Dr. M. Barry† had pointed out to him among the corpuscles of newt's blood, preserved in their own serum, and without any reagent having been applied, many which had the form of a flask, with a projecting neck, and which might be still better compared to the body of a pair of bellows, with its projecting nozzle. The projecting portion appeared to be a filament, having a much higher refracting power than the general substance of the corpuscle. Dr. Barry also showed him, in a portion of blood to which corrosive sublimate had been added, a corpuscle which was evidently destitute of the ordinary nucleus, and which contained what appeared to be a filament presenting transverse markings that resembled those of muscular fibrillæ, the interspaces being oblique.

* *Annals of Natural History*, August, 1842.

† *Ibid*, April, 1843.

Between this conflicting testimony it is difficult to decide, and the matter must be left for further investigation.

With regard to the cause of the colour of the red corpuscle, some little difference of opinion also exists. The more general view entertained is, that the corpuscle owes its colour to the contained fluid; but Schultz and others state it to be due to redness of the enveloping membrane itself, and that the fluid within is colourless. Dr. Rees details, however, in the last number of "Guy's Hospital Reports,"* some experiments which appear satisfactorily to confirm the former and more general opinion. By bursting the red corpuscles, through the property of imbibition which they enjoy, and which endosmosic property his experiments fully substantiate, he shows that the containing sacs are white and the contained liquor of a red colour. This contained liquor he also shows to comprise the whole of the iron of the corpuscle; for neither the burst sacs nor the nuclei, if properly washed, yield the slightest trace of this metal.

There can be no doubt that great confusion has arisen upon the subject, from the terms red particle, red globule, and red corpuscle, being regarded as synonymous with hæmatosine or colouring matter, while, if Dr. Rees's view be correct, the fact is that the latter is a component particle of the former.

The colourless corpuscle of Mr. Addison, and which we believe to be identical with the parent cell of Dr. M. Barry, varies in size and appearance, has a peculiar and characteristic pearly aspect, enjoys the property of refracting light, and, like the

* 2nd Series, Part 1, April.

red corpuscle, contains a very clearly defined central portion or vesicle, its outline appearing like a delicate filament just within the outer tunic of the corpuscle. The interval, between the outline of the central portion and the outer circumference of the corpuscle, is very small and without colour. Sometimes there is no interval between them, and then the corpuscles have an uniform molecular aspect. The central portion has, at all times, a molecular or minutely granulated aspect; and frequently one, two, or more granules, during the observation, become distinctly visible in it. This author views the colourless corpuscles as highly organized vesicles or cells, circulating in and forming an essential portion of the blood.

Mr. W. Jones states that Dr. M. Barry has confounded the colourless with the red corpuscles; and in combating his conclusions, that the colourless corpuscles are merely a group of discs, describes them as globular in shape, strongly refractive of light, granulated on their surface, of less specific gravity, and of somewhat larger size than the red corpuscle; so that we conclude, if these observations of Mr. Addison and Mr. Jones be correct, and there is every character of their being so, that the colourless corpuscles differ from the red in being globular, generally larger, and firmer in structure, granulated either on their own surface or on the surface of their inner vesicle, in this inner vesicle being relatively larger, in its possessing a refractive power, and being of a less specific gravity.

These corpuscles have been described by different writers as lymph globules, the white globules of

the blood, blood corpuscles of the second form, exudation and pus corpuscles. To these latter they doubtless have a very great resemblance, but it appears now to be conceded that they possess differences which stamp them as not being identical.

Though the question of the existence of nuclei in the blood corpuscle may still be considered under dispute, yet it would almost appear that every new observer strengthens the evidence in favour of their reality. Dr. Rees describes, that on bursting the corpuscle, a white globular substance is set free, which he considers the nucleus, and that it is identical with what has been called by some the corpuscle deprived of colouring matter.

The observation of Mr. Addison, that the corpuscle contains an inner vesicle, has already been alluded to, but he further states that this inner vesicle contains a peculiar matter, forming the central portion of the corpuscle, which gradually increases in size and development, and is perfectly distinct from the coloured portions. Even Mr. Gulliver, though repeating his assertion,* that the same test, which shows the presence of a nucleus in some of the lower animals, fails to do so in man, (unless it be in very young embryos,) admits that this does not prove that the corpuscles of mammals contain no central matter. And Mr. W. Jones allows that the colourless corpuscles are decidedly characterised by a nucleus, but denies it to the red corpuscles. He says in the unaltered red corpuscle there is no appearance of nuclei; but when to the blood some agent has been added, for instance,

* *London and Edinburgh Phil. Mag.*, August, 1843, p. 107.

acetic acid, minute shining particles, about one-fourth or one-fifth of the diameter of the corpuscles, come into view, but not in connexion with them. These minute particles float about quite free, and exhibit molecular movements, and consist of nothing but particles of fibrin in albumen precipitated by the re-agent.

With regard to the origin, progress, and powers of reproduction of the blood corpuscle, Dr. Barry states that, like the ovum, it is first a disc, or what is now called a cytoblast, *i. e.* a cell germ. In shape it is originally elliptical and flat, having in its centre a colourless concave portion, around which lies the red colouring matter. It first becomes round, continuing flat, then assumes an orange form, and lastly becomes a globule; during these stages it increases in size, and at the same time the globule becomes a cell, and contains a colourless pellucid semifluid substance constituting the corpuscle with its nucleus. This nucleus divides into and gives off globules; each globule, appropriating to itself new matter, becomes a disc; and each disc, undergoing changes like the first, gives origin to other discs, a group of which constitutes the colourless corpuscles of the blood, for, with the changes now mentioned, the red colouring matter is consumed. The corpuscles are propagated by means of parent cells—a parent cell has its origin in a colourless corpuscle, this colourless corpuscle being an altered disc. As the parent cell is forming the new discs within, it gradually becomes red; the discs are eventually liberated to give origin in like manner to new discs, or to be appropriated some other way. These views however are by no means generally admitted.

Mr. Macleod, who appears particularly to have devoted his attention to this part of the subject, divides the changes observable in the corpuscle into three stages.* I. The granules enlarge and become clearer in the centre, but when they have arrived at twice their original size (which they quickly do) the central part becomes dull. This dullness slightly increases, and in a short time is seen to be distinctly granular, whilst the borders of the corpuscle are observed to be well defined, smooth, and clearer than the central part. The enlargement of these bodies, with the granular appearance of their centre, seems not to depend on the aggregation of granules round a central one, but on a property which they have in themselves of enlarging and presenting that figure. During all this time they are quite spherical and are of good consistence, as they do not lose their form by considerable pressure. II. The central portion becomes less opaque, and gradually ceases to appear granular, the external portion at the same time separating in some degree from the central part or nucleus. The blood corpuscle in this stage of development has the appearance of a slightly flattened round cell, formed of a somewhat delicate but elastic membrane. During the time that the elastic membrane is separating from the nucleus, the intervening space becomes flattened. This flattening goes on to such an extent as to leave a depression between the nucleus and border. The edges of the corpuscles are flat, appearing as if they had been cut off abruptly. The convexity of the nucleus, the flattened edges of the corpuscle, and the concavity intervening between these two parts, are distinctly

* *London and Edinburgh Medical Journal*, September, 1842, p. 829.

seen when any of these bodies, at this stage of development, are observed turning upon themselves. During all these changes the blood corpuscles are perfectly circular. III. One side of the corpuscle is seen gradually to elongate itself, until it has gained a pear-shaped appearance; the opposite side then elongates itself in the same manner, and to the same degree. At the same time that the envelope is becoming elongated, the nucleus undergoes a similar change, so that every part of the corpuscle becomes narrower than before, with the exception of the middle, which remains of the same size. During these changes, the concavity which was observed to exist in the second stage, in the space which intervened between the nucleus and the border, is seen gradually to disappear; at the same time that this change is going on, the borders, which were like those of a guinea piece, become rounded, so that there is a gentle convex declivity (as he expresses it) between the nucleus and borders. The nucleus during all the above changes remains convex, and never presents a granular appearance. Subsequent to the first and beginning of the second stages, Mr. Macleod has never seen any opening in the centre of the nucleus, the envelope appearing to pass, uninterruptedly, over its surface. The envelope itself continues gradually to increase in strength from its first appearance to the complete formation of the corpuscle.

Mr. Addison considers the granules, molecules, and red and white corpuscles, as each possessing a certain degree of independent vitality, and representing different stages of the same object, the blood cell; which may be considered as

undergoing a regular series of changes, until at length it becomes colourless and filled with granules, and that these granules, as long as the cells containing them are swimming in the *liquor sanguinis,* possess the usual endowments of those granules seen in the interior of other simple cells—that is, of being reproductive objects or germs.

Dr. Rees, whose views are not altogether dissimilar, calls in aid of this hypothesis the relative specific gravity of the fluids with which the blood corpuscle comes in contact. He says* that there exists, in the blood corpuscles of a smaller size, the endosmosic power, inherent in the larger ones, of imbibing a fluid containing iron; therefore, if this theory be true, in order fully to complete the process, it would be necessary, first, that a red liquor, containing iron, should be applied to the membrane of the corpuscle; secondly, that this liquor should be of a less specific gravity than that contained within the corpuscle. These conditions really exist; for the specific gravity of the fluid (mixture of chyle and lymph,) which enters the blood by the thoracic duct is 1,024,† while that of the *liquor sanguinis* is 1,052; and the iron which exists in the chyle is not contained in the crassamentum, which forms by coagulation, but is in a state of perfect solution, probably as a lactate in the serum; so that the iron is presented to the corpuscle in a fluid, and in a form capable of being easily dissolved.

Brain and Nervous System.—Dr. John Reid‡

* *Loc. cit.*, p. 323.

† *Philosophical Transactions*, p. 1, 1842.

‡ *London and Edinburgh Medical Journal*, April, 1843.

and M. Perchappe* have given very extensive tables showing the relative weight of the brain to the whole body, and of its several parts to each other. They both agree that the female head is smaller than that of the male, not only "en masse" but in all its separate parts. The weight of the cranium is also less in the female. There appear to be grounds for the supposition that the brain arrives at its maximum weight sooner than the other organs of the body—it continues to increase up to the age of 40, remains stationary till 70, and then begins to decline; and Dr. Reid concludes, from a few measurements of the length of the corpus callosum, the depth of the grey matter, the length, breadth, and depth of the corpus striatum and thalamus, that the relative size of the parts is the same in the young as in the adult, but the weight of the brain to the other organs and to the entire body is much greater in the former than in the latter. M. Perchappe says that in both sexes the weight of the brain is evidently in relation to the stature; and Dr. Reid, carrying these observations further, asserts that, in the female, the average weight of the cerebellum is, in relation to the encephalon, a little heavier than in the male; and it would also appear, that between 25 and 55 years of age, though the average male brain is absolutely heavier than that of the female, the average female brain, as compared with the weight of the whole, is somewhat heavier than the average male brain.

M. Mandl† has investigated with much minute-

* *Academy of Sciences*, October 3, 1842.

† *Ibid*, June 6, 1843.

ness the intimate structure of the nervous system. His observations are interesting, somewhat novel, and opposed to the conclusions of former investigators. He states that the centro-spinal nerves are composed of transparent fibres undulating in a parallel direction, but never anastomosing with each other. These transparent fibres are composed of single filaments, which have only a diameter of from 0.001 to 0.002 of a millemetre, and of filaments with a double outline whose diameter varies from 0.02 to 0.05 of a millemetre; in these latter, at the internal border of each line, an external one is seen. From acting on them with water and other reagents the external line appears to belong to a sheath, inclosing the internal one; this latter, which was transparent at first, becomes coagulated and destroyed by the reagents used, and assumes a globular form, giving rise to the erroneous opinion that the nervous structure is globular in its nature.

The white substance of the brain consists of filaments with a double outline, which decrease in diameter as they approach the grey substance.

The nerves consist both of fibres with a double and with a single outline, and are never composed entirely of one only of these classes of fibres,—they being always mingled together. There may be, however, a preponderance of one or the other, according to the nerve examined. Between the anterior and posterior roots of the spinal nerves no distinctive characters are observable.

M. Mandl moreover says, that the contents of the encephalon comprise several distinct elements, as the grey and white matter and the "*corpuscles gris*

et ganglionnaires," and concludes that the nervous system is composed of two portions, a white and grey; that each of these consists of a centre and periphery; that the central portion of the white matter is found in the white substance of the encephalon and spinal marrow, and its external and peripheral part in the centro-spinal nerves; that the central portion of the grey matter is found in the grey substance of the nervous centres, and its peripheric part in the ganglionic system.

In both divisions the elementary fibres are most distinctly recognised in their respective peripheries; and each part of the nervous system contains fibres of the other portion.

With regard to the termination of the nerves, M. Mandl observes—I. That at whatever age an animal is examined, the nerves are always seen to end in loops. II. Nerves of young animals are not always provided with a sheath. When the parenchyma is forming during the development of an animal, it commences by the production of some corpuscles between the primitive fibres of the fasciculus, so as to separate one or more of the elementary fibres from the rest of the fasciculus. In proportion as the corpuscles are developed, the primitive fibres, which at first were only slightly separated from the direction of the fasciculus, become more and more apart, so as to form at last a true loop. From these observations it would appear that the number of primitive fibres in old and young animals is the same, as M. Mandl has never been able to discover any fibre dividing into two. III. The retina is composed of two portions: the internal, or that next

the vitreous fluid, is composed of the same elements as the grey substance of the encephalon; the other, the external or white portion, besides the vessels and the expansion of the optic nerve, contains the particular elements which the author calls small rings (*baguettes.*) At their outer surface there is an oily lobule, of a yellow or red colour, whilst their inner is terminated by a very fine filament.

Dr. James Stark, who has more recently laid his researches before the Royal Society, does not very materially differ from M. Mandl. He concludes, that the nerves consist, in their whole extent, of a congeries of membranous tubes, cylindrical in their form, placed parallel to one another, and united into fasciculi of various sizes; but that neither these fasciculi nor the individual tubes are enveloped by any filamentous tissue; that these tubular membranes are composed of extremely minute filaments, placed in a strict longitudinal direction, in exact parallelism with each other, and consisting of granules of the same kind as those which form the basis of all the solid structures of the body; and that the matter which fills the tubes is of an oily nature, differing in no essential respect from butter or soft fat, and remaining of a fluid consistence during the life of the animal, or while it retains its natural temperature, but becoming granular or solid when the animal dies, or its temperature is much reduced. As oily substances are well known to be non-conductors of electricity, and as the nerves have been shown by the experiments of Bischoff to be among the worst possible conductors of this agent, the author contends that the nervous agency can be

neither electricity nor galvanism, nor any property related to those powers; and conceives that the phenomena are best explained on the hypothesis of undulations or vibrations propagated along the course of the tubes which compose the nerves, by the medium of the oily globules they contain. He traces the operation of the various causes which produce sensation in giving rise to these undulations, and extends the same explanation to the phenomena of voluntary motion, as consisting in undulations, commencing in the brain, as determined by the will, and propagated to the muscles. He corroborates his views by ascribing the effects of cold in diminishing or destroying both sensibility and the power of voluntary motion, particularly as exemplified in the hybernation of animals, to its mechanical operation of diminishing the fluidity, or producing solidity, in the oily medium by which these powers are exercised.

Dr. Macartney, in a communication to the Royal Irish Academy, states that medullary fibres, (or sentient filaments, as he terms them,) assuming a plexiform arrangement, exist in every part of the brain; but that the most delicate and intricate plexuses are to be found inclosed in the grey or coloured substance, which he therefore assumes to be analogous to the ganglia of the nervous system, in which there is also a close reticulation of the nervous fibres. He further considers, that in these various plexuses, and more especially in those occupying the coloured substances, the sensorial powers of the brain reside; and that the magnitude and form of the entire brain, and of its several

parts, are merely subservient to the number, extent, and connexions of them

In the subsequent part of this paper he considers the comparative condition of the intimate structure of the brain in the chimpanzee and in two idiots, from which he deduces that the brain in these latter is less developed than in the former, and that the first deviations from the perfect brain of man appear to be with respect to the following parts:—The locus niger, the corpus fimbriatum, the white striæ in the floor of the fourth ventricle, the decussation of the pyramids, the distinction of the anterior crura of the fornix, the corpora olivaria, the degree of intermixture of the sentient or white filaments in the arbor vitæ, the corpora candicantia, and the existence of calcareous granules in the pineal gland. It is remarkable that many of these parts are not found in the first stages of fœtal life, and some of them not until after birth. The pineal gland, according to Meckel, is not perfect until the seventh year of infancy. The same parts also first decline, and ultimately disappear in animals, according to their scale of organization; and further, it is chiefly with respect to these parts that varieties of structure are observed in the brains of different rational human beings.

Dr. Macartney therefore very properly observes that, if we are ever to arrive at correct notions of the functions of the brain, it must be by careful dissections of the interior parts of the cerebral organ, and by ascertaining the correspondence between the minute structure and the endowments and dispositions of the different individuals; taking into ac-

count, at the same time, the influence of the various organs of the body, instead of ascribing to certain parts on the surface of the brain distinct and often opposing faculties, as Gall and Spurzheim have done. Dr. Macartney further observes that all the plexuses of the brain are continuous with each other; that no part of the nervous system is isolated, and consequently the different parts must exercise a mutual influence on each other; that the spinal nerves, as well as those of the brain, are not inserted in the same way as the roots of plants penetrate the earth, which has been heretofore believed, but that they are united with the parts from which they are supposed to arise, and that the spinal nerves form a chain of communication with each other after they enter the spinal marrow. It is in consequence of the integrity of the whole nervous system that the various sympathies, both natural and morbid, exist between the different organs of the body. If the continuity of the sentient or nervous filaments were to be intercepted at any one place, their functions would be arrested at that point, in the same manner as the division of the nerve destroys sensation and voluntary motion in the parts to which the nerve is sent.

M. Foville has also added somewhat to our information on the decussation of fibres at the base of the brain, almost sufficient indeed to clear up the difficulty, that has hitherto existed, in accounting for the completeness of the paralysis of one side of the body when the opposite side of the brain is impaired. He has succeeded in demonstrating " a decussation at the commencement of the spinal cord, not through

an extent of a few lines only, or by only a small number of filaments, but through the whole distance which separates the basis of the crura cerebri from the medulla spinalis, properly so called."

Mr. Viner Ellis,* noticing the differences, in the accounts by anatomical writers, of the posterior divisions of the spinal nerves, and which he assumes are owing to an uniform arrangement not having been observed, says that in the neck and sacral region each posterior division consists of a single trunk, from which spring muscular and cutaneous nerves; whilst in the back and loins it is divided regularly into an external and internal branch, which same type of distribution exists in all the nerves, with some exceptions at the extremities of the spinal column.

On the functions of the par vagum some valuable additions to our knowledge are offered by Mr. Spense and M. Stilling: the former shows that a few of the filaments of the par vagum are non-ganglionic, or motor, passing over the superior ganglion of this nerve and joining themselves to the internal root of the accessory. The white nervous cord, so formed by this junction, can be traced down over the inferior ganglion of the vagus to which it gives one or two delicate filaments, and, at last, seems principally to pass into the formation of the inferior laryngeal nerve.

M. Stilling says, in accordance with the above dissection, that the par vagum is both motor and sensitive; that the surperior laryngeal nerve is solely sensitive, having no effect in producing mo-

* *Medical Gazette*, February 20, 1843.

tion in the glottis; and that the recurrent is motor and sensitive also, though in a less degree than the superior laryngeal. The glottis and the whole larynx derive all their sensation from the first-named branch, the trachea from the recurrent branch, and the lungs from the branches of the par vagum, which they receive. The glottis depends for motion on the recurrent branch, and not at all on the nervus accessorius, while the quality of the voice is dependent on the condition of the superior laryngeal nerve and the degree of harmony between this and the recurrent branch.

M. Guarini* has published a monograph containing some experiments and observations on the *corda tympani*. He adopts the opinion that the nerve is not derived from the cranial branch of the vidian, but takes its origin from the facial. He concludes, therefore, that it is, like the facial, a motor nerve. In the second place he shows, by dissection, that the *corda tympani* is distributed principally to the fibres of the lingual muscle; and, he thinks, that it communicates a motor power to them.

From a series of experiments which are detailed the author comes to the conclusions that the hypoglossal is not the only motor nerve of the tongue, and that by its influence upon the lingualis muscle the *corda tympani* is subservient to the articulation of sound.

The suggestion that the *corda tympani* is a motor nerve, and derived from the facial, is by no means new, though the part to which its influence is sup-

* *Medical Gazette*, October 21, 1842.

plied has been a subject of much discussion. M. Guarini's experiments appear to have been conducted with much care, but require repetition before we can consider the inferences drawn from them as quite established.

Dr. Bidder, of Dorpat,* has performed some experiments on dogs, in order to ascertain the possibility of uniting nerves of different functions with one another, from which he concludes that the doing so is in the highest degree doubtful; and shows that the tendency of divided nerves to preserve their natural relations is strongly marked, though every obstacle may have been offered to it.

Muscle.—Nothing very material during the past year has been recorded on the intimate structure of the muscular system, which, in the two or three years immediately preceding, occupied so much attention. The statement made by Dr. M. Barry, and noticed in the able address of my predecessor, that muscular fibre was, in fact, a bundle of spirals, though at first meeting with some opposition, now appears to be allowed to be correct.

Dr. Guéneau de Mussy† has published some very interesting investigations on the disposition and relative arrangements of the muscular fibres of the stomach. Modern anatomists admit three layers: the first, superficial or longitudinal; the second, circular; and the third, parabolic. Our author considers that there are four in reality, if the number of these layers is to be determined by their direction

* *Müller's Archives.*

† *Gazette Médicale*, June, 1842.

and origin, and that two of these are superficial and two deep-seated. He further states that one of the superficial and one of the deep-seated layers arise respectively from the œsophageal and pyloric extremities of the viscus, the fibres radiating from either end and vanishing in its body, or intercrossing with each other. Without going into the minute details of the course and direction of these fibres, it may be stated, that in the left and cardiac portions of the stomach the superficial fibres are perpendicular to the great axis of this viscus, the deeper seated are parallel, a precisely inverse disposition being observed in the right or pyloric portion. When the œsophageal fibres contract, the fundus of the great cul de sac is brought near the cardia; at the same time the band of the minor curvature diminishes the distance between the two orifices—an arrangement which M. de Mussy is of opinion must singularly favour vomiting; the longitudinal pyloric fibres and the band of the smaller curvature causing the longitudinal contraction of the viscus, the contraction in the direction of the diameter being owing to the circular fibres. The parabolic fibres, acting in the same direction, tend to efface the cavity of the great cul de sac, and to propel the food to the pyloric extremity, while the superior fibres embracing the œsophageal orifice assist the lower fibres of that tube to close it, and prevent the regurgitation of food.

Connected with the subject of muscle we may here consider some interesting observations on the iris, presented by Mr. Hall to the Royal Society. He considers the radiated plicæ, which are seen on the

uvea in mammalia, as not being muscular; but he agrees with Dr. Jacob in regarding them as being analogous in structure to the ciliary processes. The white lines and elevations apparent on the anterior surface of the human iris he supposes to be formed by the ciliary nerves which interlace with one another in the form of a plexus. The iris, he states, is composed of two portions: the first consisting of a highly vascular tissue, connected by vessels with the choroid, ciliary processes, sclerotica and cornea, and abundantly supplied with nerves, which, in the human iris, appear, in a front view, as thread-like striæ, and which are invested, on both surfaces, by the membrane of the aqueous humour. They are more or less thickly covered with pigment, which, by its varying colour, imparts to the iris on the anterior surface its characteristic hue, and by its darkness on the posterior surface renders an otherwise semi-transparent structure perfectly opaque. The second component portion of the iris consists of a layer of concentric muscular fibres, which fibres, in man and mammalia generally, are situated on the posterior surface of the pupillary portion of the iris, but in birds extend much nearer to the ciliary margin, and consequently form a much broader layer. In fishes and some reptiles they do not exist at all. The author then proceeds to inquire into the bearings which these conclusions may have on the physiology of the iris. He thinks that the phenomena of its motions can receive no satisfactory explanation on the hypothesis of erectility alone, or on that of the antagonism of two sets of muscular fibres, the one for dilating, the other for

contracting the pupil. He is convinced that the contraction of the pupil is the effect of muscular action, but does not consider the knowledge we at present possess sufficient to enable us to determine the nature of the agent by which its dilatation is effected. He, however, throws it out as a conjecture that this latter action may be the result of an unusual degree of vital contractility residing either in the cellular tissues or in the minute blood vessels of the iris. It is from elasticity, he believes, that the iris derives its power of accommodation to changes of size, and its tendency to return to its natural state from extremes either of dilatation or of contraction; but beyond this, elasticity is not concerned in its movements.

Lungs.—The opinions of anatomists have been much divided as to the manner in which the bronchial tubes terminate, whether in a series of communicating cells or in a single "cul de sac:" the latter opinion, founded on the results of Reisseissen's investigations, prevails. Nevertheless, the more elaborate observations of M. Bourgery and Mr. Addison show that they are communicating cells. The former coincides with Helvetius and Haller in considering the air cells to have a general intercommunication throughout a lobule, but he differs from them and all previous observers in his account of the *canaux labarynthiques,* as he terms the lobular passages. He describes these as anastomosing in every direction with each other, and as turning back at the boundary of a lobule to re-enter its interior and terminate in some of the deeper

canals. Mr. Addison suggests that there is some inaccuracy in these views of M. Bourgery; for at an early period of his investigations he remarked that no bronchial tubes could be traced ending in a cul de sac; on the contrary, communicating air cells were readily seen with a lens in every section of the lungs. Several of Reisseissen's experiments were therefore repeated, and others instituted, from which ample evidence was derived that the bronchial tubes, after subdividing into a multitude of minute ramifications, which take their course in the cellular interstices of the lobules, terminate in their interior in symmetrically-branched air passages and freely communicating cells.

It would also appear that in the fœtus, the lungs have neither air vesicles nor air cells. The ultimate bronchial subdivisions are tubular, and have a regular branched arrangement, ramifying symmetrically in all directions, and terminating in closed extremities, which are generally situated at the boundary of the lobules. After respiration the bronchial subdivisions experience a great and important change: the delicate membrane composing them offers only a feeble resistance to the pressure of the air, and it is consequently pushed forward and distended laterally into rounded inflations, forming a series of communicating cells, which, meeting on all sides those of the adjoining subdivisions, are moulded by pressure against each other into various pentagonal and hexagonal forms. The cells thus formed are immediately occupied by minute air bubbles, in the multitude of which all trace of the symmetry of a branched arrangement is quite

lost. The symmetrically-branched air passages, thus formed by respiration, are no longer tubes.

The membrane of the air cells is exceedingly tough, thin, and elastic: it is a continuation of the membrane lining the interior of the bronchial tubes, and numerous granulated vesicles or cells are distributed upon it, which appear to constitute the normal form of epithelium.

The blood vessels lie exterior to or between the lobular passages; and as the membrane forming one of these passages is pressed by the inspired air into close contact with that of the adjoining ones, it follows that the capillary blood channels ramify or run between the membranous layers; and any increase of the diameter of these channels must separate these layers, so that two contiguous channels soon run into each other.

M. Bourgery,* having examined the respiratory capacity of the lungs at different ages, observes that

1. *Cæteris paribus,* the respiration is more energetic the younger and thinner the subject, and that no other condition of strength or health is equivalent to the influence of youth.

2. At the same age, the column of the respiration of the male doubles that of the female.

3. The plenitude of respiration in both sexes occurs at the age of thirty.

4. The column of air required by an individual in an *ordinary* respiration augments gradually with the age.

5. During a forced respiration the aerial capacity of the lungs presents two periods—the one ascend-

* *Academy of Sciences,* January 23.

ing from infancy to thirty years, the other descending from thirty to old age. Thus, the young man has in reserve for violent exertion an immense respiratory faculty, while the aged person is quickly "winded." The respiratory faculty is gradually worn out by the laceration of the capillary aerial and sanguineous canals; this laceration occurs, in a greater or less degree, in all powerful respiratory efforts. It begins at an early period, and increases gradually to old age, as a simple consequence of repetition of the respiratory act. It is increased by all diseases of the lungs. In its most aggravated form this state of the lung causes a circulation of imperfectly oxygenated blood, and reduces the decrepid octogenarian to the locular lung and imperfect respiration of the reptile.

The views of M. Bourgery are confirmed by the experiments made by MM. Andral and Gavarret, in order to discover the quantity of carbonic acid gas exhaled from the lungs in man. Their conclusions are interesting—1st. The quantity of carbonic acid gas, exhaled in a given time, varies according to the age, sex, and constitution. 2nd. In the male, as well as in the female, the quantity is modified according to the age, independently of the weight of the individuals experimented on. 3rd. At all the periods of life, between the age of eight years and extreme old age, the male and female are distinguished by the difference in the quantity of carbonic acid gas exhaled by their lungs in a given time. All things being otherwise equal, the male always gives forth a much more considerable quantity than the female; this difference is especially

marked between the ages of sixteen and forty, at which periods the male furnishes nearly twice the quantity of carbonic acid gas from the lungs that the female does. 4th. In the male the quantity of carbonic acid gas is constantly increasing from the eighth year to the thirteenth, the increase becoming suddenly very great at the period of puberty; from the thirtieth year the exhalation of carbonic acid gas begins to decrease, the diminution becoming more marked as age advances, so that, at the extreme point of life, the exhalation of this gas may not be greater than it was at the tenth year. 5th. In the female the exhalation of this gas during infancy increases according to the same laws as in the male; but at the period of puberty, on menstruation appearing this exhalation, contrary to what happens in man, is suddenly arrested in its increase, and remains stationary as long as the menstrual function is duly performed; when this ceases, the exhalation of the gas from the lungs is increased in a remarkable manner, after which it decreases, as in the male, in proportion as the female advances towards extreme old age. 6th. During pregnancy, the exhalation of the gas equals the quantity given forth when menstruation has ceased. And 7th. In both sexes, and at all ages, the quantity of the gas exhaled is greater when the constitution is strong and the muscular system well developed.

Liver and Bile.—In 1829, M. Amussat* propounded the view that the ascent of the bile, along the ductus choledochus to the gall bladder, depended on the

* *Academy of Sciences*, September 26.

narrowness of the duodenal opening of the duct, and on the spiral arrangement of the valves of the cystic duct, observed in man and the monkey only. These views he now re-asserts, adding, contrary to the opinion of many anatomists who deny the existence of muscular fibres in the gall bladder, that this organ as well as the excretory biliary ducts is furnished with them, and that the apparatus composed of these parts discharges its contents, not only under the influence of pressure, but probably also of contraction; that the spiral arrangement of the cystic valves has the double effect of favouring the ascent of the bile and of preventing its discharge too suddenly; that the narrowness of the orifice of the ductus communis, as compared with the calibre of the duct itself, is the physical cause which compels the bile to ascend to the gall bladder.

M. Bouisson* illustrates the effect that the free agency of the respiratory organs has upon the secretion of bile by showing that slow asphyxia causes venous congestion in the liver, and increases considerably the secretion of bile, which, he states, is produced from the venous blood of the liver; that it influences the composition of the bile, making it more dark, consistent, and as if mixed with blood; and finally, by arresting the functions of the lung, developes the supplementary function of the liver, which throws off the excess of carbon by means of the bile.

Berzelius has reviewed his analysis of bile, and comes to the conclusion that, in a physiological point of view, its most remarkable principles are

* *Academy of Sciences*, May 8, 1843.

bilin, cholepyrrhin, and mucus, and that the ancient comparison of the bile, with a solution of soap, is not entirely incorrect. Contrary to the assertion of Liebig, he says that bile is an excretion, for not only do the excrements of animals contain the products of its metamorphoses, but likewise bile itself.

Dr. Kemp* has also made some minute examinations into the composition of this fluid, from which he infers that it is a chemical compound of an electro-negative body with soda, but which is not identical with the choleic acid of Demarçay or the bilin of Berzelius; nor does he agree with this latter in attributing its peculiar sweetish taste to the presence of glycerin. He also shows that the bile in the liver is different from that in the gall bladder, and he thinks it highly probable that what has been usually termed the "mucus" of the gall bladder is an important agent in effecting the change.

Kidney and Urine.—Dr. Golding Bird, in the course of some interesting lectures on urinary deposits,† combats Liebig's theory that the occurrence of uric acid and urates is due to a re-arrangement of exhausted tissues, and comes to the conclusion that the older view, which attributed these deposits to the presence of a free acid in the urine, is the more correct. Dr. Morin, of Geneva, also says that the opinion of Berzelius, that free lactic acid is the cause of the acidity of urine and the dissolvent of the phosphates of lime and magnesia contained in it, is incorrect, and that in the majority of cases of

* *Medical Gazette*, December, 1842, and May, 1843.

† *Ibid*, February, 1843.

healthy and diseased urine free phosphoric acid is the cause. He does not, however, absolutely deny the presence of free lactic acid.

The presence of kiestein in the urine of pregnant women has received, during the year, some little attention and discussion. It may be recollected that Dr. Stark had stated the urine of pregnancy to contain, what he termed, "gravidine," the decomposition of which gave origin to the kiestein. Dr. Griffith* states he has been too hasty in adding this to our list of new elementary substances, and that it is merely lithate of ammonia which exists as a deposit in the urine of pregnant women, and has no relation nor connexion with kiestein. He also differs from Dr. Stark's assertion that the urine of pregnancy has no caseous odour. Dr. Stark, however, re-asserts his views,† and maintains that he is perfectly justified in describing this as a new animal matter and applying to it the name of gravidine. A rejoinder from Dr. Griffith‡ leaves the matter in dispute between these gentlemen undecided.

Dr. Kane, of Philadelphia,§ whose opportunities of observation have been very extensive, is unable to determine the nature of kiestein by the aid of chemistry, but comes to the following general conclusions:—

1. That the kiestein is not peculiar to pregnancy, but may occur wherever the lacteal elements are secreted without a free discharge at the mammæ.

* *London and Edinburgh Monthly Journal*, July, 1842.

† *Ibid*, September, 1842.

‡ *Ibid*, December, 1842.

§ *American Journal of Medical Science*, July, 1842.

2. That though sometimes obscurely developed and occasionally simulated by other pellicles, it is generally distinguishable.

3. That where pregnancy is possible, the exhibition of a clearly defined kiesteinic pellicle is one of the least equivocal proofs of that condition, and

4. That when this pellicle is not found in the more advanced stages of supposed pregnancy, the probabilities (if the female be otherwise healthy) are as twenty to one that the diagnosis is incorrect.

Uterus and its Functions.—M. Jobert* conceives that the peritoneum is united to the surface of the uterus by three muscular fibres, and that the uterus itself consists of a single muscle, whose fibres, arranged in superimposed layers, run in the following directions:—

1. The superficial longitudinal are, for the most part, found on its posterior aspect, where they consist of two thin superimposed layers, commencing at the fundus and running to the extremity of the vagina, to which they are attached, with the exception of a few which terminate on the neck of the uterus, above the opening of the vagina. They adhere on the one hand to the peritoneum, on the other to the oblique fibres.

2. The superficial fibres of the anterior wall of the uterus form a layer covered by the peritoneum and lying on the deep fibres; they are so disposed that they do not embrace the entire surface of the wall of the uterus, which they concur in forming, but they cross before they reach the round ligament

* *Academy of Sciences*, February 20, 1843.

of the opposite side. Some of its fibres enter into the composition of the round ligament, while others pass behind it and terminate on the sides of the organ, where they decussate with those from the posterior surface.

3. The remaining superficial fibres appertain to the tubes and to the ligaments of the ovaries; they are only apparent during pregnancy. Some arise from the fundus, adhere to those which belong to the tubes, and run to the anterior part of the ligament of the ovaries, being slightly twisted on themselves; others more numerous, at first divergent, arise from the posterior surface of the fundus of the uterus, and also run to the ligament of the ovary. Finally, some transverse fibres, arising from the posterior surface, constitute the inferior portion of the organ.

The neck of the uterus is composed of the same tissue as the body. The fibres composing it represent semi-circles, and decussate without intermixing in the direction of the commissures. This semi-annular arrangement is more evident when the female has borne children, and when the orifice of the uterus is transverse. M. Jobert also thinks that the fibres of the neck of the uterus are confounded with those of the vagina.

Dr. Robert Lee, in 1838, and subsequently, in a paper which was read to the Royal Society in 1839, showed that the spermatic, hypogastric, and sacral nerves passed into four great plexuses under the peritoneum of the body of the uterus. These he inferred were true nervous ganglionic plexuses, and formed the nervous system of the uterus; but as

these views were not coincided in, the paper was withdrawn from the Royal Society. Subsequent opportunities having, however, enabled him to pursue his investigations, he has been enabled so satisfactorily to demonstrate a system of nerves, connected with the great sympathetic, proper to the uterus, that the question may now no longer be considered as a disputed point. He further shows that these nerves enlarge with the coats, blood vessels, and absorbents of the uterus during pregnancy, and return, after parturition, to their original condition; and he also infers that it is chiefly by the agency of these nerves the uterus performs the varied functions of menstruation, conception, and parturition; and that it is solely by their means the whole fabric of the nervous system sympathises with the different morbid affections of the uterus. In fact, if these nerves of the uterus could not be demonstrated, its physiology and pathology would be completely inexplicable. This great discovery is very creditable to Dr. Lee, from having previously escaped the observation of the great anatomists who have devoted their attention to this organ.

Mr. Tubbs, M. Guislain, and Mr. Kesleven, have each recorded cases illustrative of the effects of maternal impressions upon the fœtus. The carefulness with which inquiry seems to have been made, and the decisive character of the testimony, render it necessary to admit that the popular belief in this influence is based in scientific truth.

With regard to the early age at which uterine development may take place, Dr. Carus* relates

* *Algemëine Zeitung für Chirurgie.*

the singular case of a child two years old, in whom the catamenia appeared, and continued to flow regularly once a month. The Academy of Medicine of Dresden, in order the more particularly to examine into the case, kept her under their observation during several weeks. She was rather more than 37 inches long; the mammæ were firm, like those of a strong girl of sixteen; the body was stoutly made; the head and genital organs were covered with dark brown hair; the physiognomy and tone of voice were childish, and contrasted singularly with the strength of the body; and the intellectual functions were equal to those of a child three years old.

Dr. M. Barry has added another link to the very insufficient chain of knowledge we possess on the process of fecundation. Some months since he communicated to the Royal Society the fact that he had observed spermatozoa within the mammiferous ovum. The ova were those of the rabbit, taken, twenty-four hours *post-coitum*, from the fallopian tube. He has recently confirmed the observation, several ova from the fallopian tube of another of these animals, in a somewhat earlier stage, having presented spermatozoa within the thick transparent membrane (*zona pellucida*), brought with the ovum from the ovary.

M. Raciborski* has devoted some little attention to the subject of the effects of menstruation on the secretion of milk, and he comes to the conclusions that—

* *Academy of Medicine*, May 31, 1843.

1. Contrary to the generally received opinion, the milk of nurses who menstruate during the period of suckling does not differ in any appreciable manner from that of nurses who do not menstruate.

2. The only difference worth noting is that it contains less cream—a fact on which the bluish colour of the milk of some women depends.

3. That the inconvenience of allowing women to nurse during menstruation has been greatly exaggerated; and that a nurse should never be rejected on this account alone.

While on the subject of the organs connected with generation, we may allude to some curious freaks of nature that have been recorded during the year.

Dr. Oberstadt mentions a woman with a third mamma, about three fingers' breadth below the left breast. It measures about three inches in diameter, and is provided with its proper nipple and a peculiar areola. When the woman reached her last month of pregnancy, milk flowed abundantly from it, which continued for about a month after her confinement and then gradually ceased. Dr. Macann and Mr. Prankerd have each detailed cases where there were three testicles.

Spleen.—The structure and functions of the spleen have occupied much attention both on the continent and at home.

According to Malpighi, the spleen is composed of cellules separated by spaces; in the cells exist granulations pendent from the extremities of the arteries and nerves. The veins and arteries open

into the cellules by gaping orifices. The spaces are formed by a parenchyma of fibrous and muscular bands, and contain a thickened and extravasated blood. Ruysch admitted the existence of the membranes, but denied that of the fibres and cellules, and assigned another use to the granulations. Winslow spoke of a cottony tissue, and admitted the cellules and granulations, but did not allude to the vascular capillaries. Haller acknowledged only the cellules and granulations; a little later, Assolan denied the existence of the cellules; and still later, Meckel wrote against the cellules, and Cruveilhier against the granulations in man.

M. Bourgery* says that the spleen is composed of two distinct apparatus, the vesicular and glandular, divided into little organules, in juxta position throughout the entire organ. Of these the vesicular apparatus constitutes three-sixths of the spleen; the glandular two-sixths, the remaining one-sixth being formed of vascular arrangement. The vesicular apparatus, or succession of vesicles, is continuous throughout, interspersed by orifices of communication, and comprises the splenic veins, the corpuscles, and the granular capillary membrane. It constitutes a long canal, everywhere folded on itself, and divided by vascular bands into myriads of little cavities to increase the surfaces. The texture of these vesicles and the nature of the liquid they contain causes him to regard them as an apparatus for the elaboration of the blood.

The glandular apparatus is composed of glands and lymphatic vessels. It consists of a tortuous

* *Gazette Medicale*, June, 1842.

chain of glandules connected by cords of the same substance, and situate between the vesicular ampullæ. It may be regarded as one large lymphatic gland, broken down into smaller ones, in order to surround the vessels throughout the entire extent of the spleen.

The capillary blood vessels assimilate somewhat in texture to the organ itself, the veins forming part of its tissue, and participating in its functions, while the lymphatics appear to be not merely vessels for transmitting the lymph, but at the same time organs for elaboration. These anatomical arrangements, he says, are the same throughout the mammiferæ, but in man they are more precise and defined, marking the perfection of this organ, which is more elaborate in its organization than in animals.

A discussion has taken place* between Mr. Jackson and a contributor to the *Medical Gazette*, in which the former maintains that the spleen is a contractile organ and assists in propelling the blood through the veins. Mr. Dobson says that it acts as a safety valve, so as at times to prevent the ill effects of an overloaded circulation by permitting distention, and again contracting when the necessity for its dilatation is over. Dr. O'Beirne states that its purpose is to relieve congestion of the venous system in particular. And a writer in the *Medical Times* maintains that it is a left liver formed according to a certain natural type or pattern, and that the pancreas is an appendage to it as the gall bladder is to the liver. Dr. Haygarth† maintains that it is in this organ the red principle of the blood is elaborated.

* *Medical Gazette*, vol. i., 1842-3.

† *Medical Gazette*, January 13, 1843.

The arguments which have been adduced in support of these various theories are rather ingenious than satisfactory, wherefore we need not detain ourselves with any more distinct enunciation of them.

Digestion.—MM. Sandras and Bouchardat have presented a memoir on digestion, which has received a very flattering report from the French Academy of Sciences, January 30, 1843. The committee state, that the chemical experiments of the authors have established a new and very remarkable fact, consisting in the action exerted by water, acidulated by muriatic acid, on fibrin, albumen, casein, gluten, and fibrous tissues: all these substances swell, become translucid, and some of them dissolve. The addition of six parts of acid suffices to produce this reaction. The authors have, however, gone too far in considering the muriatic acid as the only agent in the solution of azotised alimentary substances. In fact, while fibrin, under its influence, merely becomes excessively tumified, the addition of a few drops of rennet suffices to dissolve it completely; consequently muriatic acid is not the only solvent in the gastric juice. We must also probably take into account the animal substance termed "pepsin," detected in the stomach by MM. Schwann and Duchamps, and obtained in an isolated form by Trasmann.

It seems probable, according to the experiments of the authors, that the neutral azotised animal substances, when dissolved in the stomach, pass directly into the veins; gluten is acted on in the same way; starch and fecula are changed partially

or entirely in the stomach into lactic acid, and are absorbed in that state. The fats evidently resist the action of the stomach, and pass into the intestinal canal; the authors regard them as the chief agents in the production of chyle.

Teeth, &c.—A very able report was read at the Academy of Sciences, by MM. Serres, Dutrochet, and Flourens, December 5, 1842, on a memoir, by Mr. Nasmyth, on the teeth.

The teeth have been considered by some as composed of solid fibres, by others as an assemblage of tubes, filled either with calcareous matter, blood, or a colourless fluid; and all anatomists, with the exception of Malpighi, give the absence of areolar arrangement as the specific character of dental tissue. Mr. Nasmyth and Mr. Richard Owen, on the contrary, assert that the areolar arrangement constitutes the fundamental character of the structure of the teeth; but they admit the cellular arrangement both in the enamel and the ivory.

With regard to the much disputed point whether the fibres, which contribute to form the ivory, are hollow or solid, or, in other words, whether the teeth are a collection of tubes or of fibres, Mr. Nasmyth submitted to the Academy preparations which he thought negatived the former view, and proved that they are composed of fibres only; but the commission felt justified in asserting, that they were anything but conclusive on this point—a view which coincides with the researches of M. Retzius.* But what particularly struck the reporters was, Mr.

* *Academy of Sciences*, October 17, 1842.

Nasmyth's establishing a similarity of organization between the enamel, ivory, and bulb.

If we consider, with Hunter, the teeth as a product of secretion from the external surface of the bulb, we are led to conclude that the enamel is also deposited on the crown by its enveloping membrane, an idea to which the recent researches of M. Duvernoy* give a very high degree of probability; but it is, on the other hand, difficult to reconcile this theory with that of interstitial secretion, thrown out by Rau, and supported by Mr. Nasmyth and Mr. Owen. Indeed we must confess, if the labours of these latter-named gentlemen have demonstrated the mode of formation of ivory, they have thrown no additional light on the manner in which the enamel is produced.

According to M. Retzius, the ivory is deposited in layers round the surface of the pulp, the external layer being the one first formed, and so on. While this deposition is taking place, the external cells and the peripheral extremities of the tubes are formed; and, as the successive layers of ivory are deposited, the tubes become continuous from one layer to another, in such a manner that the successive segments of tubes form at last one uninterrupted canal. It would seem that the numerous parallel undulations of the tubes are occasioned during their passage from one layer to another. The enamel, he thinks, (an opinion coincided in by Duvernoy,) is probably nourished by imbibition of an organic fluid, carried by the ivory tubes, and transmitted through a thin membrane, which probably surrounds the different cells.

* *Academy of Sciences*, November 14.

Bone, &c.—M. Mandl* has pursued the minute anatomy of osseous structure. He affirms—first, that in the osseous tissue small canals and bony corpuscles can be distinguished; secondly, that these canals contain a capillary vessel and fat, and that their walls are composed of concentric lamellæ; thirdly, that the lamellæ are traversed by lines proceeding from the centre to the circumference.

Skin, &c.—The organs which secrete the sweat, and which were first pointed out by Breschet, and afterwards described by Purkïnjé, Gurlt, Wagner, &c., Dr. Giraldes† has studied more particularly, and added a few additional facts. According to him, they are composed, not of single canals divided at their extremity, but of a straight canal which pierces through the whole thickness of the derma, and is embedded in the fatty layer beneath it. Sometimes they penetrate this fatty layer to a very considerable depth, and at the extremity of the fingers may even be seen to traverse it completely. Arrived at this point, these canals sometimes dichotomise; in general, however, they remain simple, and roll on themselves so as to form a small button-shaped body. These convolutions are sometimes all on the same plane; at other times present a spheroidal appearance.

Dr. Robert Willis‡ says, that the purpose which is answered in the animal economy by the cutaneous exhalation has not yet been correctly assigned by

* *Academy of Sciences*, December 26.

† *Academy of Sciences* and *Edinburgh Medical and Surgical Journal.*

‡ Royal Society.

physiologists: the author believes it to be simply the elimination from the system of a certain quantity of pure water, and he considers that the saline and other ingredients which pass off at the same time by the skin are in too inconsiderable quantity to deserve being taken into account, and that this elimination is important as securing the conditions which are necessary for the endosmosic transference, between arteries and veins, of the fluids which minister to nutrition and vital endowment.

Dr. Kemp has contributed* a very elaborate paper on the elementary composition of mucus. The secretion operated on was obtained from the gall bladder of the ox. When moist, the mucus thus obtained may be described as a greyish gelatinous opaque mass, not soluble in water, but becoming transparent in that menstruum. When dried at 100° the colour changes to a dark olive. Dr. Kemp considers its atomic proportions to be, carbon 48, hydrogen 39, nitrogen 6, oxygen 17, which is equivalent to one atom of protein, *plus* three of water, and very nearly identical with the middle coats of arteries, the composition of which is one atom of protein, *plus* two atoms of waters.

Articular Cartilage.—M. de Lignerolles has succeeded, by the means of very fine injections, in demonstrating the organization of articular cartilage, and has shown vessels injected upon the articular surfaces. This anatomical fact is the more worthy of attention, as the most eminent men do not admit the organization of cartilaginous tissue, and from

* *Medical Gazette*, July 29, 1842.

its interfering with the theory of nourishment of these membranes promulgated by Mr. Toynbee.

Lymphatics, &c.—Dr. Willis, in a paper read before the Royal Society, has followed up the views of Majendie and Wagner, in denying to the lymphatics the function of absorption, and referring it entirely to the veins. As it is, this vast system of vessels is left without any assigned purport.

Mr. Robinson * goes a step further, not only asserting that the process of absorption in animals arises from, and depends upon, a force existing within the blood vessels, but that this force itself is generated by, and proportioned to, the velocity of the moving mass, by which in a healthy state they are incessantly traversed.

PATHOLOGY AND THERAPEUTICS.

This interesting portion of my subject offers much that is worthy the attention of the practical physician. In detailing which, nearly the same order will be adhered to as has just been adopted. We shall first draw attention to the more recent observations on the diseases of the brain and nerves.

Brain and Nerves.—Every one, acquainted with diseases of the nervous system, is aware of the extraordinary contradictions which are recorded regarding them; and a reference to any of the works published on the pathology of the brain and spinal cord will show that many cases present themselves that baffle all attempts at explanation. The conse-

* *Medical Gazette,* May 26, 1843.

quence is, that this interesting subject is still involved in great obscurity. Professor Gluge* has, however, directed attention to this department of pathology; and Dr. J. H. Bennett has published † 32 cases of cerebral and spinal disorders, where the symptoms, *post mortem* appearances, and microscopic examination of the diseased textures, are accurately recorded. From these it appears that at least two distinct kinds of softening exist in the nervous centres, which may be readily distinguished by the microscope. They are characterized by the presence or absence of *exudation corpuscles*, and may be denominated inflammatory and non-inflammatory softening.

An analysis of the cases given by Dr. Bennett will also show that these two kinds of softening are not only distinguishable after death, but may be recognized by the symptoms which accompany them during life. These researches further establish the two following propositions:—1st. That pathologists have hitherto confounded softening occasioned by *post mortem* changes, or mechanical violence, with softening occasioned by inflammation. 2nd. That notwithstanding the most curious search, and the existence during life of the most decided symptoms of inflammatory softening, the inflamed tissue, though really present, has escaped observation, so long as unaided sight is made the sole means of forming a judgment respecting its nature.

Professor Gluge distinguishes the appearances of softening of the brain according to colour. The

* *Östr. Med. Woch.*, January 22, 1842.

† *Edinburgh Medical and Surgical Journal*, Oct., 1842, & April, 1843.

softening sometimes occupies the white or grey substances exclusively, but in most cases both. He has observed softening of a considerable portion of the cerebrum, cerebellum, pons, walls of the ventricles, &c., but not of the spinal marrow; the disease was never general, and hence the states of the affected and sound parts could always be compared together. The degree of consistence of the softened parts varied much, as did also the colour, from white and gray to light red and yellow—the latter colour being the most frequent.

Dr. Bennett says that his observations have not only proved the correctness of the above, but further demonstrate:—

1. That the microscopic bodies, peculiar to cerebral softening, may occur primarily in the form of granules, masses, and nucleated corpuscles.

2. That these so-called exudation granules, masses, and nucleated corpuscles, may be observed coating the blood-vessels externally, clearly indicating their origin.

3. That they are found equally in the red, yellow, and white softenings of the brain; in what has been considered chronic as well as in acute softening.

4. That the softenings in which these bodies have been detected, both from their appearance and from symptoms which have accompanied them, are of an inflammatory nature.

5. That these bodies have been found in great abundance where no appearance of softening or inflammation was evident to the naked eye, yet where the symptoms of such lesions were well marked.

6. That white and yellow softenings may exist without the presence of exudation corpuscles, masses, or granules; but that the symptoms which accompany these are not those indicating inflammatory softening.

7. That the red, yellow, or white softenings are in no way dependent upon or connected with the infiltration or presence of pus.

The physical properties and mode of formation of the exudation corpuscle are thus described by Dr. Bennett:—Direct pressure causes large drops like oil to appear within the cell-wall, or to exude through it; by friction, the granules of which it is formed, may be dispersed. From this, as well as from the effects of chemical agents, it would appear that oil enters largely into their composition. The exudation corpuscle is formed like all other primary cells: a nucleus is produced from which a cell-wall arises. During or subsequent to its full growth, granules are formed between the nucleus and cell-wall; these become more and more numerous until at length the nucleus is observed, and the whole cell appears full of, and distended with, granules. In this state it has reached its full growth; the cell-wall bursts and its contents escape. This process, going on simultaneously in common corpuscles, causes the coagulated exudation to become soft, pultaceous, or even diffluent. It is in this manner that inflammatory softening is produced.

Dr. Durand Fardel* has published several cases to prove the curability of cerebral ramollissement, which he considers to be due in every case to local

* *Bulletin de Thérapeutique*, July, 1842.

or general vascular congestion of the brain. Cerebral ramollissement, according to Dr. Fardel, is curable at two different periods of its existence: at its commencement, when the tissue is not so disorganized as to prevent its return to the normal state, or the cerebral functions to their primitive integrity; and again, at a later period, when the disorganization of the nervous pulp is arrested, and the part undergoes a process of induration or cicatrisation, analogous to the mode of cure of apoplect c clots. In the first case, a complete removal of the anatomical lesion and the symptoms which indicate its presence may be effected; in the second, the pathological change will continue, as will also often a certain degree of alteration in the encephalic functions. In the last named cases the term cure is applicable in the same manner as it is under similar circumstances in cases of cerebral hæmorrhage.

M. Prus has contributed a memoir* on meningeal apoplexy, of which the following is the substance. He distinguishes this form of apoplexy into two species, viz., sub-arachnoid and intra-arachnoid, and points out the differences between them. In sub-arachnoid hæmorrhage the blood is frequently derived from a ruptured artery or vein; in twenty-four cases related by the author this occurred fifteen times, and the rupture of the vessel may have existed in the remaining nine cases. In intra-arachnoid hæmorrhage the effusion of blood always arises from exhalation of that fluid. In the former species the blood is mixed with the cerebro-spinal fluid, and has a constant tendency to pass into the ventricles and

* *Academy of Medicine,* April 4, 1843.

vertebral canal; in the latter species the effused blood is generally limited. In sub-arachnoid apoplexy there is never found any trace of false membranes; but in intra-arachnoid we always have a false membrane enveloping the clot about the fourth or fifth day. Muscular paralysis rarely accompanies sub-arachnoid hæmorrhage; it was met with only thrice in twenty-four cases. On the other hand, in eight cases of intra-arachnoid apoplexy, muscular paralysis occurred six times. Loss of sensation, when it does exist, which is very rare, is but slight in both cases. Deviation of the mouth is peculiar to meningeal hæmorrhage. Somnolence and coma almost constantly exist in both. In sub-arachnoid hæmorrhage are neither delirium, fever, nor peculiar dryness of the tongue, which belong to the arachnitis that comes on, about the fourth or fifth day, in cases of intra-arachnoid hæmorrhage. Sub-arachnoid hæmorrhage was constantly fatal within eight days. In cases of intra-arachnoid apoplexy the patients sometimes lived for eighty days or more, and occasionally recovered, the blood being absorbed by the enveloping cyst.

Dr. Smyth re-produces an account formerly published by him of the existence and character of a murmur, or sound, accompanying the cerebral circulation in certain conditions of disease in children, and which, he thinks, may be received either as a premonitory symptom of chronic hydrencephalus, or as a diagnostic sign of the actual existence of that disease in its most incipient state. He observes that it is always concomitant with, and produced by, a morbid action of the vessels of the brain, immediately

preceding, or associated with, more or less dropsical effusion in that organ.

Dr. Black* offers an explanation of the local pain experienced in neuralgic affections, especially in those of an intermittent type. Irrespective of constitutional or other derangements, he conceives that it is caused by pressure from dilatation, of an hyperæmic and atonic nature, of the blood-vessels surrounding or accompanying the nerves affected, as they pass through unyielding canals or apertures in bone, cartilage, or through fibrous sheaths or fasciæ of more or less density and resistance; and that the intermittence depends on the diurnal or periodical nervous exhaustion, or accumulation of excitability in the system.

M. Stilling supposes that spinal irritation is dependent on congestion in the capillaries of the spinal cord; and says that exudation of serum invariably accompanies this state of sanguineous congestion, producing softening of the surrounding structures, so that in *post mortem* examinations of persons who have died with the above disease, the spinal cord has been found in all stages of ramollissement.

Dr. P. J. Bauduy, of Cuba,† details a case of traumatic tetanus, in which, after spasms had extensively prevailed, cure was effected by enlarging and cauterising the wound, with hot cataplasms, the free exhibition of sub-nitrate of mercury, (on which particular stress is laid,) together with purgative

* *Provincial Medical Journal*, March 11, 1843.

† *Ibid*, December 31, 1842.

and stimulating injections of garlick; and Mr. W. Jackson* reports two cases of hydrophobia, caused by bites from the same dog. The chief morbid appearances observed after death were an injected state of the substance and membranes of the brain and spinal cord; he therefore suggests, that every person, after being bitten by a rabid animal, should be subject to a long but mild course of mercury, in the hope that it may first obtain possession of the system, to the exclusion of the hydrophobic irritation.

In *Müller's Archives* a curious case of diseased tarsal joint, with dropsy, is detailed, in which the nerves, as they approached the affected part, became thickened, and as if composed of fat. Portions of the saphenus and other large branches of the ischiatic, so far as they could be separated from the degenerated mass, were examined under the microscope, when it was found that an extraordinary quantity of fat had been deposited within the sheath and between the fibres of the nerves, which increased in irregular gradations as it was traced downwards, till it constituted the whole structure of the nerve. The fat globules appeared to be arranged concentrically on the inner surface of the sheath, and by a strong magnifying power the primitive fibres could, at the upper part, be distinctly seen running in the centre of the fatty deposit. They gradually disappeared lower down, till at length no trace of them could be found, the fat globules having entirely taken the place of the primitive nervous fibres.

* *Provincial Medical Journal*, January 7, 1843.

Tongue.—Dr. Abercrombie has contributed to the Medico-Chirurgical Society of Edinburgh a short paper on stammering, in which, though the views advocated may not be altogether new, yet, in these days of barbarously cutting and mutilating the tonsils, tongue, &c., come with a pleasant freshness, and are therefore quoted here. From certain observations he was led to conjecture that this affection does not depend upon any defect in the organs of speech, properly so called, but is rather connected with a deficiency in the management of the voice; and he thought it would be found, that when a stammerer gets into that peculiar state of hesitation which is familiar to every one, he is endeavouring to speak when he has no voice, *i. e.*, when the lungs have become emptied of air.

According to these views, the principles in which the cure of the affection may be accomplished appeared to be to direct the attention of the individual to the three distinct parts of which the function of speech consists, viz.:—

1. A full and continuous current of air proceeding outwards from the lungs.

2. The formation of this into inarticulate sound, or voice, by the action of the larynx.

3. The formation of this into articulate sound or speech, chiefly by certain movements of the lips and tongue.

Circulating System.—Dr. Craigie* has contributed a very valuable paper upon aneurismal affections of the heart, in which he comes to the conclusion that,

* *Edinburgh Medical and Surgical Journal,* No. clv.

at present, we possess no precise diagnostic means to determine the existence of this lesion. It can be rendered merely probable when we find, associated with symptoms of hypertrophy, irregular cardiac action like jerks or spasmodic twitches, rasping murmurs, fits of faintness or giddiness, small irregular arterial pulse, with peculiar feelings of constriction at the heart, sometimes with, often without pain; that it is not possible, contrary to the opinion of Breschet, to fix the date of the origin of the disease; that, like other diseases of the heart, it appears to follow rheumatic attacks, and not unfrequently violent corporeal efforts and a life of dissipation and debauchery; that the cysts have no power of contraction; that death is not usually produced by the tumour bursting; that most commonly the patient expires after a long and painful agony, as in other diseases of the heart.

In the course of this paper Dr. Craigie details a case in which, unlike other recorded cases, the aneurismal lesion was situated in the septum cordis, where, in the space between the right lacinia of the mitral valve and two of the semi-lunar valves, was a large oval aperture, leading into a cavity of a spherical form, sufficiently large to admit and contain a good-sized walnut.

With regard to the action of the heart in disease, Dr. Macleod states, that when excited by organic change, it is not so perceptible to the patient as when only sympathetically influenced.

Dr. Addison has published some interesting cases in which chorea appeared to be complicated with inflammation of the pericardium. The absence of

all general disturbance was the same as is observed in chorea; and it is by no means improbable that the heart itself may become affected by that disease, and present the same irregular movements, in common with those muscles which are supplied with nerves of voluntary motion. Dr. Addison observes, that derangement of the heart in chorea is by no means rarely indicated by the existence of a distinct bruit, audible over the whole precordial region.

Two interesting cases of blue disease have been detailed, arising from unusual malformations. The one occurred in an infant which at four months' old died at the Foundling Hospital, in Paris. Nearly all the anterior half of the thorax was occupied by the pericardium, and the heart consisted of only one ventricle and one auricle, the deep sulcus between which was filled with a process of the liver and a part of the diaphragm. The auricle was much larger than the ventricle, with parietes very much thickened; and at its posterior part the two vena cava opened into it by a sort of sinus, apparently a rudiment of a right auricle. The pulmonary veins terminated in the ordinary manner. The ductus arteriosus was wanting. No other viscus was malformed. The other, related by Mr. Douglas,* is the case of an infant which died at the age of fifteen months; the foramen ovale was open, and about three-eighths of an inch in diameter; the aorta was about a third larger than usual in a child of his size, and took its origin equally from both ventricles; it had the usual three valves at its commencement; the ductus arteriosus was open, scarcely larger than

* *Medical Gazette*, September 30, 1842.

a crow-quill. From where it joined the pulmonary artery the latter divided into its right and left branches; but its trunk was little larger than a crowquill, back near the right ventricle, where it was quite impervious. The two ventricles were of equal thickness, communicating with the aorta. The septum was deficient just at the root of the aorta, presenting a smooth concave border, leaving an opening though which the fore-finger could be passed. The mitral and tricuspid valves were normal. The upper angle of the right ventricle was directed as usual to the pulmonary artery, but there was no opening nor were there any traces of valves. The other viscera appeared natural.

The course of the circulation must have been very uncommon, inasmuch as the blood must have passed in a retrograde direction through the ductus arteriosus, that being the only way in which any *could* get to the lungs, as the root of the pulmonary artery was closed. The blood from the system, poured from the venæ cavæ into the right auricle, and that from the lungs into the left, from the pulmonary veins, must have mingled freely in their passage simultaneously into the aorta; besides that, a portion of the contents of the right auricle must have passed directly into the left to help to fill it, the quantity which had come through the lungs having been very small indeed.

Dr. Favell* relates the case of a female, weighing 10 stone, who never suffered from ill health referable to heart disease, in which this organ weighed only three ounces and a half. The two

* *Provincial Medical Journal*, January 28, 1843.

ventricles were so small as only to admit the little finger; the walls of the left ventricle were considerably thicker than natural, and the aorta and pulmonary artery were, relatively to the size of the cavities of the heart, very large.

Dr. Skoda* details a case in which puncture of the pericardium for dropsy of its cavity was attended with success. The sounds of the heart were scarcely perceptible, but towards the inferior part of the sternum a slight *bruit de râpe* was heard. A trocar was plunged between the third and fourth ribs on the left side of the sternum, giving passage to a quantity of reddish serum, which spirted out at each contraction of the heart. The patient felt much relieved, and was enabled, for the first time for three weeks, to sleep on her back; the next day the œdema was diminished, the sounds of the heart were more audible, and the *bruit de râpe* had disappeared. She improved rapidly and at the end of the month seemed cured, when she died from another cause.

Aneurism of the aorta, until its existence is announced by a tumour capable of being seen or felt, has ever been regarded as one of the most obscure diseases within the range of medicine. Dr. Robert Law† has produced an interesting paper, in which he states that, in the early period of this affection, the diagnostic sign upon which the most reliance can be placed, is pain presented in a twofold character, the one being constant, dull, and aching, the other occasional, sharp, darting, and lancinating; but that this sign is only present when the aneurism is placed

* *Oesterr. Med. Jahrb.*, 1841.

† *Dublin Journal*, July, 1842.

amidst parts of an unyielding nature. He believes that this character of pain, though not *always* present in aneurism, is never an attendant upon any other morbid condition. It is difficult to state decidedly its cause; the sharp lancinating pain bears some resemblance to the neuroses, while the dull aching constant pain may be connected with the destruction of the structure of the vertebræ, with which it is so often associated; or with the position of the aneurism, which, from the pressure exerted by the surrounding textures, is prevented from enlarging itself; or it may be characteristic of inflamed arterial tissue. Dr. Law observes, however, that the greatest amount of suffering has been accompanied by caries of the vertebræ. Dr. Harrison has stated* that aneurism arising from the fore part of the abdominal aorta and extending into the cavity will also be attended by pain. From this opinion Dr. Law decidedly dissents: he believes it is experienced in aneurism from the *front* of the aorta only when the tumour is, as has been stated, so situated as to be compressed and restrained from enlarging by the surrounding textures.

Mr. Gulliver† says that the peculiar affection of the arteries which has been termed "atheromatous" is really a degeneration of a fatty nature, consisting of a multitude of crystalline plates and fatty globules with albuminous and earthy particles, which were found by Dr. Davy to be cholesterine. Mr. Gulliver assumes that a consideration of this fatty degeneration is of great importance from its connexion with

* *Dublin Medical Journal*, vol. v., p. 435.

† *Transactions of Medico-Chirurgical Society.*

thickening and puckering of the inner membrane, with aneurism, with obstruction, occlusion, or ossification of the vessels, and with those ruptures of them which are frequently the cause of sudden death. In a note the author adds that fatty degenerations are more common and of more importance than has yet been supposed. He mentions obstruction, by fatty particles, of the seminal tubes; and states the existence of fatty degeneration of the blood, lungs, &c., and that its presence is more remarkable in the "brown consolidation" of the lungs than in the "red," both of which afford distinct morbid products.

Dr. Peacock* has related some cases of obliteration of the arteries and veins. When this lesion took place in the circle of Willis, the symptoms, 24 hours before death, were severe rigors, followed by headache, convulsions of the muscles of the face and extremities, and coma. In a case in which the vena cava inferior was obliterated, there was general dropsy and hæmatemesis; the heart was healthy; the liver small and covered with a net-work of dilated veins; the vena azygos, as well as the lumbar and spinal veins, greatly distended; these appeared, in fact, to have been the channel by which the circulation was maintained. From the net-work of dilated veins which existed on the liver and diaphragm, Dr. Peacock conceived that the portal system assisted in facilitating the backward flow of the blood.

Several cases of slow pulse have been reported; one by Dr. Fletcher, in which, before rising in the

* *Provincial Medical Journal*, February 25, 1843.

morning, the number of strokes did not exceed 28 in the minute, nor after the greatest exertion 40. In this case the sounds of the heart were not abnormal, but it appeared to be distorted to almost as great an extent as possible before each contraction, which took place in a very sudden manner. Dr. Peacock* has collected several other instances of this affection and, among them, that very remarkable case detailed by Mr. Holburton, in the last volume of the *Medico-Chirurgical Transactions,* in which the pulse was occasionally as low as seven beats in the minute. After canvassing the different opinions which have been entertained upon the subject, he comes to the conclusion that extreme slowness of pulse, though an occasional attendant on different forms of disease of the heart, is not a necessary feature in any; and, as the peculiar condition of that organ, essential to its production, is probably one of deficient power with the absence of excitement, it may be expected to attend the last stage of diseases which, at an earlier period, are of very different types.

Dr. Todd† combats the opinion that true hæmorrhage can take place by simple exudation, and asserts that it is always owing to rupture of a vessel. He also says, in the same paper, that in scurvy and purpura the blood itself is diseased; this condition consisting in an imperfection of the blood corpuscles. Some of these were found to be distinct and large, most of them measuring from $\frac{1}{2000}$ of an inch to $\frac{1}{3000}$ of an inch; but a vast number of much smaller, roundish, or

* *Provincial Medical Journal,* 1842, vol. i., p. 70.

† *Dublin Journal,* September, 1842.

irregular bodies existed, some of which seemed like shrivelled corpuscles, but the majority resembled little aggregates of granules, adherent to each other, with small particles of colouring matter intermixed, forming bodies ranging between $\frac{1}{4000}$ of an inch and $\frac{1}{5000}$ of an inch in diameter. These bodies were much more numerous than the blood corpuscles, and Dr. Todd thinks it not unlikely they might be corpuscles in an imperfect state of development, the imperfection of the formative process being due to some alteration in the chemical and vital properties of the blood. This view is supported generally by Dr. Rees, in a paper on the pathology of the blood, which has been previously referred to. He is more specific as to the cause of disease, regarding the healthy condition of the membrane of the blood corpuscles, by which endosmodic actions take place, as being of the same importance to the maintenance of life as is the pervious condition of the respiratory tubes, and that life would be equally destroyed by the loss of these special properties in the former as by the closure of the latter. Let the blood become destroyed, he says, so that its specific gravity is lessened, and we may feel assured that if the physical qualities, more especially the specific gravity of the chyle, be not simultaneously affected, and that too, in a due proportion, the result must be that the red colouring matter, the great oxygenator of the blood, is no longer produced in its ordinary quantity, the ferruginous serum of the chyle not being able to enter the blood corpuscle as in health. If the degeneration above alluded to take place, we must recollect that all the solids of the body, through

which the blood courses, are formed with pores and of materials admitting of endosmodic action, and that it is impossible for the solid constituents to preserve their health if constantly acted upon by the blood at a specific gravity of 1030 to 1036 instead of 1052 to 1057—the equilibrium of health being no longer preserved, and the watery blood inducing a like condition in the other solids.

Mr. Gulliver* has directed attention to the presence of pus globules in the blood in severe inflammations, and shows the difference between them and the pale globule natural to this fluid. The former differ from the latter in being rather larger, more irregular in size and form, and sometimes more opaque, clustering together in a very remarkable manner, sometimes of a reddish colour, including from one to four blood discs, rarely five or six, in a very delicate and pale envelope, and the molecules composing the nucleus are mostly surrounded and often widely separated by a quantity of minute granular matter.

Dr. Bennett† has described the mode in which the products of inflammation, or, as he terms it, abnormal nutrition, are developed: he states that *softening* is produced by the escape, from nucleated cells, of exudation corpuscles, which are produced in any structure which is rendered dense by the presence of coagulated *liquor sanguinis;* that *suppuration* is caused by the exudation corpuscles passing into cells, or pus corpuscles, which swim in fluid, roll freely on each other, are of a yellow greenish

* *London and Edinburgh Philosophical Magazine*, September, 1842.

† *London and Edinburgh Journal*, December, 1842.

colour, and constitute the organized part of the fluid known as pus, &c. In fact, in the same manner as in a state of health, cells originating in the effused *liquor sanguinis* may undergo different kinds of development, as into fibre, muscle, nerve, &c., constituting normal nutrition; so in a morbid state cells originating in exuded *liquor sanguinis*, may be transformed into exudation, plastic, pus cells, tumours, &c., constituting abnormal nutrition. Inflammation, therefore, is only a part of one great morbid action occurring in the frame.

Adventitious Growths, Tubercle, and Diseases of the Chest.—Before commencing a notice of such observations as have been made on diseases of the chest, we shall devote a short space to the structure of adventitious tissues and tubercle. On the former subject Dr. Hodgkin has contributed a paper,* in which he re-asserts some opinions previously hazarded by him.

1st. That adventitious tissues, including the whole family of cancerous diseases, belong to the type of compound serous cysts. In this view the late Professor Delpech and Professor Rokitanski have independently coincided.

2nd. That the microscopic examination of these tissues, though extremely interesting, does not furnish perfectly conclusive tests of any particular form of adventitious structure to which a specimen may belong, but that it demonstrates the application of the nucleated cell theory, whilst it is fatal to that of cancerous matter being found in the

* *Transactions of Medico-Chirurgical Society.*

blood, and eliminated at the spots at which the tumours become manifest. It therefore furnishes an important argument in favour of operation, though other practical considerations require to be attended to before operation is decided on.

3rd. That to have a complete view of the mode of production of these structures, we must combine the cell theory of Schwann and Müller, the coagulation principle which the author had previously suggested, and the process of organization investigated by Kiernan—three stages of development that appear to occur in the order in which they have just been enumerated; and that none of the phenomena, taken singly, is an adequate test of malignancy, which, as stated in his first paper, must be regarded as the sum of several characters.

4th. That chemical analysis, though extremely important and interesting, affords an imperfect and inadequate criterion, as the principles concerned may vary, or be changed in the progress of development.

5th. That in operating for the removal of a tumour of this class, it is extremely important to leave behind none of those minute cysts which often form granules in the surrounding cellular membrane, though it may appear to be in other respects perfectly healthy. This appears to be a mode of extension of the disease independent of inflammation.

6th. That experience teaches us that the infiltrated form of these diseases occurs in the structures in the neighbourhood of the purely adventitious growth, when these structures have been the seat of inflammation; and that the chances of success from opera-

tion are consequently infinitely diminished, when such surrounding inflammation has taken place. The presence of the peculiar matter of the disease, in the interior of vessels, appears to be one of the modes in which infiltration, the result of inflammation, exhibits itself, and is therefore not a valid argument in favour of the pre-existence of such matter in the circulating blood.

Sir Charles Scudamore says that tubercle, when examined microscopically, is found to consist of an assemblage of corpuscles, of various size and shape, sometimes containing granular matter of exceedingly minute granules, and in some of the smaller kinds of tubercles, as in the grey miliary, besides the constituents above-mentioned, of cells of a more regular form and size, and larger than the corpuscles. In the crude or firm tubercles, the corpuscles are closely packed together, and the granular matter is rather scanty; whereas, in the larger and softer kinds, the corpuscles are easily separable, and the granular matter is in great abundance. The form of the corpuscles is for the most part globular or oval, but in the softened tubercles they are very irregular as to their shape, being often elongated and pyriform. They vary in diameter from about $\frac{1}{3000}$ of an inch to $\frac{1}{2000}$ of an inch. The granules also are very variable as to size. Mixed with them are found myriads of minute globular bodies, scarcely capable of being measured by our ordinary micrometers, being much less in diameter than $\frac{1}{25,000}$ of an inch. These are most abundant in the soft tubercles, which, in fact, appear to consist of little or nothing else but gra-

nules or broken-down corpuscles. The cells are more constant in size and shape than any other constituents, and average in diameter about $\frac{1}{1500}$ of an inch. Nuclei are sometimes apparent; but as the tubercle increases in size, the cells become disintegrated, and finally disappear. The essential part of the constitution of tubercle is that of cells and granules, but this peculiar cell of tubercle is never found in blood, and consequently must be a local formation; and he thinks it may be reasonably suggested, that the tubercle is nourished and receives its growth by means of cells, on the same principle that the non-vascular tissues are nourished by them, as so ably shown by Mr. Toynbee.

These views are however, entirely opposed to the observations of Mr. Addison; he refers the origin of tubercle to the blood corpuscle, affirming it to be composed of abnormal epithelial cells, and not as due to any peculiar formation foreign to the normal structure of the tissue.

With regard to the composition of tubercles, he does not materially differ from the account above given by Sir C. Scudamore, affirming them to consist, for the most part, of molecules, granules, and granulated corpuscles, of various sizes, or aggregated granules without any tunic, and of collapsed tunics without any granules. These objects are mingled with a great many flakes and shapeless filaments, which are no doubt fragments of the membrane of the air cells and of the minute blood vessels, which, when involved in a tubercle, become so extremely brittle that they must necessarily form

a considerable portion of the objects occupying the field of the microscope. The granulated corpuscles of a tubercle are sometimes very large ($\frac{1}{800}$ or $\frac{1}{1000}$ part of an inch,) and the molecules and granules, which are very conspicuous, may frequently be seen on the point of escaping from them. The semi-transparent forms of tubercle and tubercular infiltrations owe their peculiarity to a great relative amount of granulated vesicles, whereas the opaque white forms of tubercle are attributable to great numbers of isolated granules. Mr. Addison further views the matter of hepatization, the spots of lepra, and other cutaneous affections, as identical with tubercle, the difference being that in pneumonia the deposit is diffused over a wide space, is general and extensive, aud takes place with rapidity; whereas in phthisis it occurs in patches, at more or less distant intervals, accumulating very slowly; and in eruptions on the skin they are less formidable in their symptoms and less fatal in their tendencies, not from any peculiarity in their nature, but from the physiological uses of the part they occupy. He therefore says, that the circumstances which determine the formation of tubercles must be studied in conjunction with the origin and progress of cutaneous disease, to many of the chronic forms of which tubercles of the lungs have the most marked analogy. This view is further supported by Dr. Bennett's observation of the parasitic plant occurring in tinea and consumptive sputa being identical; this subject will, however, be subsequently alluded to.

In a communication to the *Archives Generales de*

Medicine M. Briquet has some observations on tubercles of the serous membranes, in which he comes to the conclusion that they are the result of inflammation, and not of a chronic character, because they are always situated on the free surface of the serous membranes; that they are found almost exclusively on those membranes which have been the seat of pain and other symptoms of phlogosis, and, in the greatest number, in that part of the membrane which showed the strongest signs of inflammatory action; and, finally, that they do not exist in the false membranes, but spring directly from the surface of the serous, there not being any false membrane in or about them by which they could be enveloped, or of which they might have been a transformation.

With regard to the relative frequency of tubercle, Dr. Engel, of Vienna, says that its occurrence in the lungs is to that of tubercle in the cerebral membranes, the pleura, liver, and spleen, as 18 to 1; to that of tubercle in the brain and kidney as 18 to 2; and to that of tubercle in the peritoneum and intestines as 18 to 2. This is the more remarkable when compared with the relative frequency of cancer in the same organs. Cancer of the lungs occurs, in proportion to cancer of the liver, as 18 to 48; to cancer of the stomach, as 18 to 42; to cancer of the intestines and kidneys, as 18 to 12; and to cancer of the brain, spleen, peritoneum, and uterus, as 18 to 18.

M. E. Boudet thinks that between the ages of one day and two years tubercles exist in the lungs and bronchial glands in 1 of 57 subjects; from two to

fifteen years, in three out of four; from fifteen to seventy-six years, in six out of seven; that is to say, during this period of life, six out of seven present recent or old tubercles, and their presence may be considered the rule, their absence the exception. M. Boudet also says, that the favourable modifications of tubercles of the lungs are 1. *Sequestration.*—The tubercular matter, without being obviously changed in its nature, is isolated from the surrounding parts by means of a mucous, or a fibrous, or a fibro-cartilaginous membrane. 2. *Induration, i. e.*, the tubercle is of a dry friable consistence, or it becomes tenacious and dense, though fatty to the touch, or it becomes calcareous. 3. It is converted into *black pulmonary matter.* 4. It is *absorbed.* 5. It is *eliminated* by the bronchiæ. These transformations, which sometimes coexist in the same individual, may be effected during any of the periods of the evolution of tubercles. Out of 197 promiscuous cases, in ten a cavity, completely cicatrised, was found, without any recent tubercle. In eight cases the complete or incomplete cure of one or several morbid cavities coincided with the presence of recent tubercles. Pulmonary cavities cicatrise by the organization of an accidental mucous membrane, or by the formation of a fibro-cartilaginous envelope. Whether the cavities communicate or not with the bronchial tubes, they may remain open.

M. Rayer, in a paper on consumption, as occurring in man and the lower animals, says that the earthy or calcareous concretions which are often found in the lungs ought not to be considered,

as they generally have been, a modification of tubercle; for they are, often in man, and very frequently in the horse, the remains of a deposit of pus. To this assertion M. Prus does not at all assent: he says that for the ten years he has been endeavouring to ascertain, at the Bicêtre and Salpetrière, the curability of tubercles, he has been led more and more to believe that the earthy concretions, which are almost always at the summit of the lung, are only modified tubercles; that they are generally accompanied by traces of cicatrization; that sometimes old cavities, lined with a new mucous membrane, co-exist along with them; and lastly, that it is easy to find, even in the same lung, tubercles in different degrees of progress, which present all the phases of this secretion, from its origin to its earthy state; and that frequently the same cyst contains both tubercle and earthy matter.

During the progress of consumption Dr. Robert Williams has weighed the patients: one general rule was observed in all, viz., that the loss of weight was not continued, but intermittent. The patient being weighed weekly, and as nearly as possible under the same circumstances, showed an alternate increment and decrement generally of one or more pounds on each alternate week. The decrement, however, usually exceeded the increment, and consequently every few days an increasing balance was left against the patient.

M. Dupasquier, in prosecuting his investigations into the action of the ioduret of iron, says that in simple tubercular deposit, though it may not remove the symptoms, it is capable of modifying and

somewhat relieving them; when cavities are formed, however, its chief beneficial effects are evidenced in improving the appetite and muscular strength, and relieving the cutaneous exhalation; that altogether it appears most useful in the third stage.

Dr. Hastings, of the Blenheim Street Free Dispensary, says he has employed with success naphtha internally administered and inhaled in the form of vapour. He was induced to try it from finding that it possessed a peculiar power over tubercle out of the body; reducing it to an amorphous powder. Sir Charles Scudamore* reasserts the efficacy of the inhalation of iodine, and Dr. Durrant† lays stress upon the frequent exhibition of emetics together with the employment of iodine and sedatives. But while these and other gentlemen are detailing the efficacy of various remedies, Dr. Robert Williams produces before the *Medico-Chirurgical Society* a history which depresses all hope. He states that some years ago he began a series of experiments on possible remedies in phthisis, satisfied that general treatment was of little avail, and that the cure of the disease must be sought for in a specific remedy. This series embraced preparations of platina, palladium, osmium, iridium, titanium, chromium, and cerium. He subsequently tried every seed that Messrs. Charlwood, of Covent Garden, could furnish, and he had previously tried every wood, every bark, and every gum he could obtain. Nothing appeared beneficially to influence the disease; the result was as usual, uniformly fatal; but the termination was

* *Lancet*, August, 1842.

† *Provincial Medical Journal*, September 3, 1842.

not accelerated as to time, or aggravated in the preceding phenomena. The pathological appearances also in the cases examined after death were the same as when the ordinary mode of treatment was adopted; not the slightest attempt at reparation was seen in any part of the lungs. No injury, however, was done except in two cases, treated with white hellebore, in both of which death was so remarkably hastened, that it seemed as if that substance or probably the veratrine it is said to contain, acted as a poison in phthisis. He concludes by saying, however, that the large number of substances he has tried, as possible remedies for the cure of this fatal disease, has assured him that there is no class of substances which a prudent physician, beginning with small doses, and gradually increasing them, may not safely make use of, in his attempts to cure this or any other intractable disorder.

Two memoirs on the nature of emphysema have been presented, one by M. Prus, the other by M. Cocchi; that of the former gave rise to an animated and interesting discussion in the French Academy. The inquiry merged itself into two questions:—1st. As to the nature of emphysema—2nd. As to its prognosis. M. Prus regards emphysema as depending upon an infiltration of air into the inter-vesicular, inter-lobular, and sub-pleural cellular tissue. The regularity of the little bags in which we find the air is not opposed to this view, being insufficient to prove that they are are always formed by distension of the vesicles, as some believe. He is supported in this view by Dupuy, who says that emphysema occupies the inter-lobular cellular tissue; by

Olivier D'Angers, who says that it is air interspersed into interstitial cellular tissue; and Lombard, who refers it to destruction of the intervesicular septa; while Louis presumes that it consists in hyperthophy of the pulmonary vesicles, and Blandin in dilatation of them. Rochoux, however, says that by a strange confusion of terms two very distinct diseases have been confounded under the name of pulmonary emphysema, one consisting in dilatation of the pulmonary cells, the other in infiltration of the air between these cells—an opinion in which it would appear M. Bouillaud coincides, when he divides it into spontaneous emphysema of essentially slow formation, and that of traumatic origin; these appear to represent the senile and accidental emphysema of Royer Collard. According to M. Cocchi, pulmonary emphysema consists in the diminution or suspension of the action of the organic phenomena proper to the pulmonary cells, with dilatation and loss of elasticity in their walls. Their rupture is of rare occurrence; and it is still more uncommon to find air infiltrated into the inter-lobular cellular tissue. He distinguishes emphysema into two kinds, the *protopathic* and the *deuteropathic*. The first arises from some power applied directly to the diseased organs; the second from affections ordinarily chronic in the lungs, the heart, the large vessels, or other viscera. With regard to the prognosis in this affection much difference of opinion also exists. Laennec and Louis are both inclined to view emphysema as not tending to a fatal termination, while Prus and Olivier maintain that it may even cause sudden or *almost* sudden death, and that it is

otherwise injurious by rendering the pneumonia of old people more fatal.

Pneumonia.—In addition to the memoir of MM. Rilliet and Barthez, Dr. West has contributed* a very valuable memoir on the pneumonia of infants. It would not be fitting this retrospect to go into the lengthened analysis of this paper which it would require; we shall therefore merely state that he considers the diseases under the heads of lobar, lobular, and vesicular; that lobar inflammation is more frequent than is usually supposed; that winter is the time most prone to the attacks of this disease; that a large proportion of deaths ($17\frac{1}{2}$ per cent.) are attributable to it in the two first years of life; that there is a very slight excess in male mortality; and that it occurs generally in those previously in good health.

Dr. Hughes,† in comparing this disease with phthisis as regards its location, comes to the conclusion that pneumonia is only double in 19 cases per cent., while phthisis affects both lungs, more or less, in 90 per cent. That while pneumonia was confined to the base of one or both lungs in 62 cases per cent., tubercles were confined to the base of the organ in only one case out of 250; and that while the upper part of the lung was principally, primarily, or solely affected with tubercular deposit in 94 cases out of every 100, pneumonia was confined to the same part in only five; and as this occurred generally in persons above thirty years of age, it tends

* *British and Foreign Medical Review*, April, 1843.

† *Guy's Hospital Reports*, October, 1842.

to confirm the opinion of Louis, that pneumonia of the apex is rather an affection of an advanced period of life.

The treatment which is recommended by Dr. West in the pneumonia of infants is depletion by leeches, and where applicable by venæsection and the exhibition of tartar emetic and calomel, followed by stimulants and blisters, or rather mustard poultices.

The plan advocated by Dr. Hughes for adults is not dissimilar: venæsection and calomel with opium combined with tartar emetic, followed up by local bleeding and blisters.

Dr. Henderson,* with regard to the use of venæsection and tartar emetic, advocates the views of Grisolle, not that the one or the other practice should be exclusively adopted, but that it is not necessary to repeat the venæsection so often as the patient seems capable of bearing it; that much of the cure may be safely intrusted, in a great many cases that would still admit of depletion, to the antimony; and that, since antimony alone is evidently so potent a remedy, we have no reason to despair of ultimate recovery in cases that will not bear the evacuation of blood—a remark which can seldom be made of any other considerable inflammatory disease than pneumonia.

Dr. West has added some judicious observations on the general management of infants in this affection. He says they should be taken from the breast, and the mother's milk, barley-water, or some other diluent, given from a spoon. This is of import-

* *London and Edinburgh Journal*, April, 1843.

ance on two accounts:—first, because the thirst experienced induces them to suck over much; secondly, because the act of sucking is in itself mischievous, from its influencing the respiratory functions. Another important point is, never to allow the children to lie flat, but to place them in a semi-recumbent position. By so doing, respiration is facilitated, since the diaphragm is relieved from the pressure of the abdominal viscera, and that state of the fluids in the posterior parts of the lungs is prevented, which has been shown by French writers to be prejudicial to infants or children labouring under pneumonia. He also advises, that when pneumonia has reached an advanced stage, or has involved a considerable extent of the lungs, the children should be moved only with the greatest care and gentleness, lest convulsions be brought on. Whatever may be the explanation of this occurrence the danger is by no means imaginary, for he has seen instances in which children have been seized with convulsions immediately on being lifted into a sitting posture.

Dr. Calvert Holland has drawn attention to a peculiar form of consumption, (as he terms it,) occurring in Sheffield, caused by dry grinding, a process which envelops the grinder in a cloud of dust. It sets in with cough and slight expectoration, coloured with the inhaled dust, which does not interfere with his occupation; eventually, however, difficulty of breathing is experienced, aggravated on every exertion, whether of walking or coughing; and then the grinder is regarded by himself and others as attacked with asthma, a term almost univer-

sally employed at Sheffield to designate this disease. Mr. Porter has detailed a very careful autopsy of this affection, from which it appears that there were no tubercles, but that the whole surface of the lungs was covered with black spots, about the size of currants, and similar ones were found throughout the whole pulmonary tissue; the lungs were slightly crepitant, except in the upper portion of the right lung, where was a very large cavity, and in a small portion of the left, which was indurated and firmer than the liver. Beside the small black bodies above mentioned, others were found in various parts of the lungs four or five times as large; all were quite black within and gritty, and the larger ones of so firm a texture that it was difficult to cut through them.

Dr. Craigie has related a case of acute farcy in which the existence of the disease was clearly established during life. On investigating its history it was ascertained that about three months previously to the patient's illness there were, in the same stable in which he kept his horses, two affected with glanders; and though it could not be proved he had been in direct communication with them, it is not unfair to conclude infection may have been then contracted, as there can be no doubt that the diseases are identical, for, as Rayer says, "In man, as in the horse, farcy and glanders are morbid states produced by the same contagious poison, and differing only in their seats."

Croup.—In the treatment of this complaint Dr. Dreyer* has gradually arrived at the conclusion

* *Neüe Zeitschrift für die Geburtskunde,* 13 *Band,* 1 Heft.

that the safest and most satisfactory plan is the constant exhibition of emetics, but more particularly of the sulphate of copper, to the extent of a sixth of a grain every ten minutes until vomiting has been copiously produced.

In that peculiar affection of crowing respiration, the thymic asthma of some writers, Dr. Marshall Hall* repeats his opinion, that it is caused by nervous irritation dependant on a state of sub-inflammation necessary to the process of dentition, and urges the necessity of frequent scarification of the gums, and to such an extent as to prescribe its use daily.

Fever.—It is not a little singular, considering the length of time since the discovery of the evolution of carbonic acid during respiration, that no very satisfactory observations have been instituted tending to prove an abnormal state in this respect during disease. Some meagre observations are to be found in the works of Nysten and Jurin, and some slight notices in the researches of Lavoisier and Seguin. The first of these authors came to the conclusion that the quantity of carbonic acid is increased in the early stage of acute fevers, and diminished in obstructions of the lungs. Jurin stated it as his opinion that the last stage of fever favoured the production of carbonic acid; while bleeding and the cold stage produced a diminution; and these conclusions were generally corroborated by the combined observations of Lavoisier and Seguin. Dr. Malcolm, of Belfast,† has instituted a series of expe-

* *Lancet*, July 9, 1842.

† *London and Edinburgh Journal*, January, 1843.

riments during the progress of typhus, from which results differing from those above related have been arrived at. He concludes that in this disease the formation of carbonic acid gas during respiration is considerably less than in a state of health, the difference being as nearly as possible one-fifth per cent., a difference which in a number of cases is too large to be the result of accidental circumstances. The quantity generated is least in the more severe forms of the disease. The diminished proportion however is not at all uniform; on some occasions the number being very low indeed, and in others rising to even as high as nearly three per cent. The difference between the proportion of carbonic acid gas generally, as influenced by fever, and in the severe forms, is, it may be observed, as nearly as possible two per cent., a difference perhaps too small to form the basis of any general conclusion.

It will be recollected that M.M. Andral and Gavarret have given within the last three years some interesting accounts of their experiments on the blood in fever. Signor Renzi,* of Naples, has availed himself of the ample opportunity he enjoys to pursue the enquiry, and his observations go far to confirm the statements of the French physicians: first, that the coagulum of the blood becomes soft and oleaginous; secondly, that the proportion of its fibrine very sensibly diminishes from the standard of health; thirdly, that the proportion of the red globules is larger than usual; and fourthly, that the cruor is more or less mixed with the serum, being partially dissolved in, and tinging it of a

* *Il Filiatre Sebezio.*

red colour, the remainder being precipitated in the form of a pulverulent sediment. The hematosine has but little coherence with the red globules and the fibrine.

Besides these observations Signor Renzi has added some peculiar to himself, from which it appears that not only is the proportion of red globules increased above the ordinary standard of health, but the greater number of them, besides being readily freed from their colouring matter, seem to lose their central nucleus and appear in consequence to be less compact, less solid, and, so to speak, less living than is normally the case. In the second place there exists in the blood of typhus patients, a peculiar smell somewhat like that of sheep's blood beginning to become putrescent.

M. Facen* has also contributed some observations on the state of the blood in agues, in which he states that, at the commencement of an intermittent fever, it scarcely, if at all, differs from its normal condition unless the patient has been previously bled, and then the proportion of the serum is rather less than usual; but in almost all cases where the return of the paroxysms has been frequent, the tendency of the fibrine to coagulate firmly increases until at length the blood acquires a perfect buffy crust as in inflammatory diseases—the thickness and consistency of the crust varying, in different instances, according to the frequency, the severity, and the duration of the febrile paroxysms.

With regard to the pathology of intermittent fever, M. Piorry says, it originates directly from affections

* *Memoriale sulla Medicina Contemporanea.*

of the nerves of the spleen, and that as long as hyperthophy of the spleen continues fever remains. According to M. Landerer,* the principal pathological changes are seated not only in the spleen but in the liver and bile; the latter especially undergoes great changes in colour and consistence, being of a deep brown and considerable density, and contains an enormous quantity of cholesterine. We must not quit the subject of fever without adverting to the extraordinary effects which Dr. Graves† ascribes, in the delirious and nervous stage of typhus, to a combination of tartar emetic and opium.

M. Von Katona, of Hungary, after renewing the experiments of Drs. Home (1758) and Spranza (1822), in inoculating for the measles, speaks highly of its value in dangerous epidemics. He says, in seven per cent. of the cases the inoculation failed, but in the remainder the disease ran its course in a very mild manner, strikingly different from its then prevailing character; in no instance was it fatal when thus communicated. The inoculation was performed in the same way as for small pox, by inserting some fluid mixed with blood taken from underneath the efflorescence, or a tear-drop. A red areola formed round the point of insertion and then gradually declined. About the seventh day fever and the usual premonitory symptoms of measles set in; on the ninth or tenth day after inoculation the eruption appeared and ran its usual course, but in a very mild manner. On the fourteenth day the fever commonly declined,

* *Repertorium für die Pharmacie.*

† *Clinical Medicine.*

and on the seventeenth, or seven or eight days after the appearance of the eruption, the patients were convalescent.

Dropsy.—Sir Henry Marsh* has described a variety of dropsy which he terms "*strumous peritonitis with effusion.*" It consists in an inflammation, either chronic or acute, of the serous membranes of the abdomen, and occurs under a variety of circumstances in persons of a peculiar constitution, terminating in effusion; the quantity and quality of the effused matter varies considerably in different individuals, influencing materially the progress and ultimate issue of the case. It is sometimes presented in an acute form, and runs a rapid course; more frequently, however, its early symptoms are obscure, its progress slow and tedious, and the effusion does not take place until after a considerable length of time. Oftentimes, if the true nature of the disease be detected, it yields to judicious and well-directed treatment; but in other instances, the symptoms, though mitigated by treatment, recur again and again, until at length the patient is cut off by this formidable malady. He does not recollect having met with any example of this affection either during infancy or after the middle period of life; all the cases which have fallen under his observation having occurred in individuals of from three and four to about thirty years of age. It frequently arises without the intervention of any well-marked existing cause, and sometimes sets in either gradually or abruptly during the progress of

* *Dublin Journal*, March, 1843.

some other disease. The remedies of most importance are blood-letting, blisters, mercury, and iodine; upon the judicious adaptation of these remedial agents to each stage and period of the disease, and to the constitution and condition of the patient, depends in a great measure the success of the treatment.

Dr. O'Beirne* has likewise published a valuable paper on the cause and treatment of dropsy, in which he endeavours to show that its origin is due to venous compression; he also states that the spleen performs an important function in the venous circulation, namely, that of being a reservoir for the relief of overloaded states of the vena cava inferior and the whole portal system. It would not be consistent with the limits of this address to give an analysis of the bearings of this view upon the different kinds of dropsy; I must therefore content myself with stating the general result of his inquiries. 1st. That all the phenomena of dropsy are but the products of venous obstruction, and that venous obstruction is caused either by diminished capacity of the lungs, or by an increase of the circulating mass of venous blood, or by both of these causes combined. 2nd. That dropsy is not of an inflammatory nature. 3rd. That this disease, with the exception of the early part of its course, is attended with more or less of general debility. In accordance with these views Dr. O'Beirne suggests that the proper treatment in these affections is frequent venæsection, the occasional use of purgatives and diuretics, and keeping the strength supported by nourishing diet and gin and water.

* *Dublin Journal*, November, 1842.

Kidney.—The phosphatic urinary deposits have been receiving considerable attention, more especially from Drs. Golding Bird and Aldridge. Dr. Prout considered them as the result of cachexia, and Dr. Bird says that one general law certainly appears to govern their pathological development—a constantly depressed state of nervous energy, often general, rarely local, in its seat.

The connection of a phosphatic condition of the urine with a peculiar form of indigestion has been pointed out, and cases have fallen beneath my own notice which enable me to vouch for the accuracy of the remark; for it is not uncommon to find an iridescent film, formed of a thin layer or pellicle, of crystals of triple phosphate, floating on the surface of urine passed by persons labouring under irritative dyspepsia. This peculiar condition of the urine is clearly the result of imperfect assimilation, and in all probability is to be regarded as an attempt at ridding the system of the earthy phosphates absorbed from the ingesta. In this form Dr. Bird states he has never seen a decided gravel or deposit produced, and is inclined to consider it rather as an index of the state of the assimilative functions than as holding out any fear of the ulterior deposit of calculous matter.

It has generally been considered with Dr. Prout that the essence of this disease consists in a supersecretion of the urinary phosphates. Dr. Aldridge however states,* that in place of these being increased, their quantity in the urine is for the most part diminished, and that its essential character is

* *Dublin Journal*, March, 1843.

an alkaline, neutral, or feebly acid condition, the cause of its tendency to alkalinity depending upon an existing subacute or chronic nephritis. Dr. Aldridge does not however deny that cases may occur in which an increased quantity of the phosphates are present, such as old diseases of the bladder, long-continued catarrh, fungoid growths, &c.; but in these instances the super-quantity of the phosphates is secreted by the lining membrane of the viscus itself.

Dr. Bird has proposed for the relief of some cases of this disease injecting the bladder with a very dilute mineral acid; he says he has seen many cases, where viscid ropy mucus, mixed with abundance of phosphates, both magnesian and calcareous, has been secreted, and where the distress of the patient has been extremely increased by intense irritability of the bladder, successfully relieved by this mode after all other plans of treatment proved unavailing.

That interesting disease, *diabetes mellitus,* still engages considerable attention. Dr. Watts regards its proximate cause as threefold:—the cause of the first stage being an inflammatory condition of the mucous and glandular structure of the stomach; of the second, a state of atonic excitement, resulting from the activity of the former; and of the third, nearly perfect atony of the nerves, which bestows upon the stomach the capability of secretive action. The first stage is not characterised by sugar in any of the fluids, and it may terminate without passing into the second; the second stage may continue for some time, and not proceed into the last;

if the causes which induce the third and last stage be applied during the existence of the first stage in sufficient strength, the third stage is at once induced, to the exclusion of the second; and from the circumstances of the third stage passing into rapidly terminating phthisis, with cessation of all its symptoms, the saccharine urine among the rest, the disease does not depend upon any structural lesion. The three stages, with their products, may be thus shown:—First stage, lactic acid, lithate of ammonia; second stage, fat, sugar; third stage, lactic acid, accompanied by emaciation.

Mr. Combette* reports a case of this disease, which he entirely succeeded in curing by the exhibition of the ioduret of iron; the patient was at the same time restricted to animal diet, a bottle of claret daily, with a flask of Bagnole wine, broth without bread, and lemonade. Under this treatment he gradually recovered.

M. Bonnifous relates a case, which was cured by warm clothing, animal regimen, and gluten bread. The patient came under his care four months after the first appearance of the disease, and then voided daily two pailfuls and a half of urine, containing *7 grammes, per cent.*, of sugar. The quantity of urine gradually diminished, the sugar completely disappeared, and in three months and a half he left the hospital, apparently cured.

Mr. Robinson,† from a series of experiments to show the connexion existing between an unnatural degree of compression of the blood contained in

* *Gazette des Hospitaux*, October, 1842.

† *Medical Gazette*, February 14, 1843.

renal vessels, and the presence of certain abnormal matters in the urine, concludes :—

1. That the process of the effusion of albumen and lymph through the coats of the vessels of the living body is dependent on, and regulated by, the degree of the compression of the blood contained in those vessels.

2. That simple compression of the blood in its smaller vessels will cause the exudation of liquid albumen, of coagulated lymph, and the escape of blood; and as both the essential causes of undue compression are known to exist in inflammation, it is but reasonable to conclude that the primary effects of the latter, which are identical with those of undue compression, are the mere consequences of that physical cause.

3. That there is no relation between the composition of the effused matters and the extent of the dilatation of the coats of the vessels, as measured by the quantity of blood they contain.

4. That a gradually increased quantity of blood may be directed to the vessels of a particular organ, without causing any unnatural compression of that fluid.

5. That if the quantity thus determined be considerably and *suddenly* increased, then some of the effects of undue compression of the blood will be produced.

If these views of Mr. Robinson be correct, they satisfactorily account for the presence of albumen, not only in Bright's disease, but in *petechiæ sine febre,* in females suddenly weaning their infants when they have a full supply of milk, which Dr.

Malden* states to be the case, and its sudden appearance in scarlatinal dropsy, &c., as also in the case reported by Dr. Percy, of Birmingham,† in which albuminous urine supervened after a poisonous dose of corrosive sublimate.

It has long been known that, in confirmed albuminurea, urea may be found in the blood, and that, to its presence there, some have been disposed to attribute the fatal tendency of this disease. M. Simon however says that he has detected it in simply inflammatory blood; and Professor Kane found it, in large quantity, in the fluid drawn by tapping the abdomen of a female affected with ascites, combined with symptoms of albuminurea.

M. Bouchardat‡ and Dr. Bogner § have published notices of the occurrence of blue urine, which, from the analysis of the latter, appears to be caused by the presence of the prussiate of iron. As neither of the patients had taken preparations containing iron or prussic acid, it is inferred this substance was eliminated in the system, especially as both these cases occurred in persons whose constitutions had suffered from previous disease.

Calculi.—On the subject of calculi some important facts have been collected by the examination and arrangement of those in the museums of the Royal College of Surgeons of London‖ and Saint George's Hospital. From the former it appears that out of six hundred and forty-nine calculi,—

* *Provincial Medical Journal,* April 30, 1842.

† *Medical Gazette,* March 24, 1843.

‡ *Journal de Chimie Medicale,* December, 1842.

§ *Casper's Wochenschrift,* No. iii., 1842.

‖ *Vide* Catalogue.

Uric acid forms the nucleus of	278, or	nearly as 5 to 12.
Urate of ammonia	201 ...	... 4 to 13.
Oxalate of lime	95 ...	... 1 to $6\frac{3}{4}$.

The number of calculi which are homogeneous, or consist of the same substance throughout, is 315, being in the ratio to the whole number nearly as 1 to $2\frac{1}{16}$; of those composed of two layers, 210, or as 1 to $3\frac{1}{11}$; of three layers, 87, or as 1 to $7\frac{1}{2}$; and of those consisting of four or more layers, 18, or as 1 to 36. The calculi at Saint George's Hospital, amounting to 233, were examined by Dr. Bence Jones, whose object was to arrive at conclusions with regard to the comparative frequency of different states of the urine in calculous complaints, and thus to obtain practical hints as to the efficacy of remedies intended to alter the secretion itself, or act upon the stone in the bladder. He presents several tables: and taking 450 states of the urine, inferred from the composition of the calculi, finds that in 139 it was alkaline, and in 311 acid, to the test paper. Omitting from the latter list 59 specimens of the oxalate of lime, 252 cases of the uric acid diathesis remain; and in 117 of these no free acid was passed, from which the author concludes that alkalies would have been of no benefit in them, so far as neutralizing acidity of the urine was concerned. Taking the cases in which the alkaline concretions prevailed, he infers that in 52 the calculus might have been lessened by the injection of dilute acids, and in 12 the whole calculus might have been removed; while in others, to which he refers, disintegration might have been effected. He also describes a calculus in the possession of Mr. Hawkins, the nucleus of which

consists of cystine, and which, from the history, appears to have been formed when the patient was $2\frac{1}{2}$ years of age.

Mr. Butter of Winchester* details a case of calculi occurring in the appendix cœci vermiformis, and which he concludes were formed in the appendix itself. Their composition was almost identical with some found in a similar situation by Mr. Wickham,† being composed of inspissated mucus, fatty matter, and oxalate of lime.

Dr. Hoskins‡ has prosecuted the subject of injecting the bladder, in order to break down phosphatic calculi, which he thinks he has satisfactorily effected by the employment of weak solutions of some of the vegetable supersalts of lead, such as the supermalate, saccharate, lactate, &c., but more particularly the nitro-saccharate. He states that these are more active in their action on calculi and less irritating than any of the fluids hitherto employed.

Saliva.—The chemical condition of saliva and the nature of salivary concretions have received some little attention. It would appear that the saliva is impregnated with lactic acid chiefly in gout, rheumatism, ague, diabetes, and gastro-enteritis; with acetic acid in aphtha, scrofula, scorbutus, small-pox, protracted indigestion, and after the use of acescent wines; with hydrochloric acid in simple gastric derangement from immoderate or improper animal food, and with uric acid in gouty

* *Provincial Medical Journal*, March 25, 1843.

† *London Medical Journal*, vol. iii.

‡ *Transactions of the Royal Society.*

affections. When oxalic acid exists in the saliva its presence will most likely be dependent upon defective digestion or imperfect assimilation. The salivary concretions, of which several cases are detailed, are for the most part described to be long and cylindrical in shape, as if formed in the excretory ducts, extremely rough and of a dirty yellowish colour, internally white and chalk-like, and of a stony hardness. One concretion, however, is described as soft and porous.

M. Desmanes has reported a case of calculus of the lachrymal canal. It was extracted from a lady, aged sixty-six, who had always enjoyed good health, with the exception of a few slight attacks of gout, which left some concretions on the finger and toe joints. The calculus weighed one-tenth of a grain, and yielded, on analysis by M. Bouchardat,

Solid albuminous substance	25
Mucous matter	18
Fat	a trace
Carbonate of lime	48
Phosphate of lime and magnesia ...	9
Chloride of sodium	a trace
	100

Liver.—We are happy to find that an operation which has been pursued in India with the completest success, that of puncturing the liver in cases of abscess of that organ, has been performed twice during the past year in Europe; in the case reported by Dr. Portal, of Palermo, successfully; in that by Mr. Martin, its failure appears to have been

influenced by circumstances which do not invalidate its utility.

Any observations upon that very obscure affection, phlebitis of the liver, are worthy of notice; we therefore, though not deeming them altogether satisfactory, call attention to the remarks of M. Lambron,* who says that phlebitis of the liver may be diagnosed, if, after some days of general disorder and epigastric derangement, more or less perfect accessions of fever show themselves, at first intermittent, then remittent, and finally almost continuous and not curable by the sulphate of quinine, especially if at the same time there exist local pain and emaciation, and a typhoid state follow the feverish accessions.

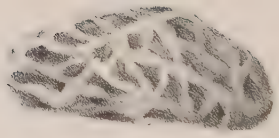
I shall here venture to call attention to a singular and, I believe, unique case of calculus of the liver, which I have myself reported.† The patient had long been jaundiced, suffered pain on the right side on pressure, where was evidently a fulness and hardness. He occasionally experienced all the symptoms of the passing of gall stones; a few days after which, small dark-coloured matters, not unlike carraway seeds, were found mingled with the fæces. On the examination after death the gall bladder was seen involved in a mass of scirrhus; the common biliary duct was scarcely pervious enough to admit an ordinary-sized pin; the liver itself was large and hard, gorged with bile, and here and there could be picked out the carraway-seed-looking bodies. They were, without doubt, moulds of the secreting surfaces of the liver, and apparently con-

* *Archives Generales de Medecine.*

† *Climate of South Devon*, p. 103.

CALCULI OF THE LIVER.

Natural Size.



Magnified 14 Times

Dr Shapter's Address

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sisted of inspissated bile. They are evidently entitled to be called "calculi of the liver." They are about the tenth of an inch in length, and one-sixteenth in width, slightly curved and kidney-shaped, very light, ten weighing only one grain; their surfaces are covered over with ridge-like reticulations.*

Skin, &c.—Dr. Hayn† has described a case of that singular affection, "the indurated cellular tissue," in which the muscular system was the seat of the disease. The muscles were changed into a hard solid substance, of a vitreous and almost transparent aspect, cutting with a noise analogous to that of scirrhous tissue. When examined by the microscope their structure was found completely changed, being formed of fine longitudinal parallel fibres, possessing great extensibility, excepting here and there where portions of healthy fibre still remained.

Dr. Advena‡ has described the occurrence, in the form of an epidemic, of what he terms *induratio thecæ cellulosi colli*, the *pseudo-erysipelas sub-tendinosum colli* of Ludwig. He says that it had a dangerous, and in some cases a fatal course. It was ushered in by febrile symptoms, followed by a wooden-hard tumour of the cellular tissue surrounding the submaxillary gland, while the gland itself was free from swelling. The tumour would extend from the angle of the jaw to the chin, and frequently draw into the hardening process the cellular tissue between the top of the trachea and cavity of

* *Vide* plate.

† *Caspar's Wochenschrift.*

‡ *Berlin Medicinische Zeitung.*

the mouth, as well as the muscles of the neighbourhood. The tongue thus rested as it were upon a hard floor, and the capability of opening the mouth and of swallowing was but very limited. In course of time suppuration would take place, producing an ill-smelling matter.

M. Souty* has recorded a case of monstrosity, in which the skin had attained such a thickness as to prevent the development of the cartilages of the ears, nose, and eyelids; the genital organs were also deficient.

M. Gruby† has described a new species of contagious sycosis as occurring in the hairy part of the face, but particularly on the chin, upper lip, and cheeks. It consists of white, grey, or yellow scabs, from two to six millimetres broad, and from three to eight long; they are traversed by the hairs, which do not adhere firmly to the skin, so that in removing the scab the hair comes away also by the root. On examining the hairs by the microscope it is found that all their dermatic portion is surrounded by cryptogamic plants, forming a vegetable layer between the sheath of the hair and the hair itself. M. Gruby, in consequence, wishes that this disease, with favus and aphthæ, which he considers as composed of parasitic plants, should form a distinct class known by the name of "nosophyte."

Dr. Bennett has contributed a memoir to the Royal Society of Edinburgh, which has chiefly for its purpose to extend and confirm the above observations; he has traced the growth of mycoder-

* *Academy of Medicine*, September 20, 1842.

† *Academy of Sciences*, September 15, 1842.

matous vegetations in several cases of *tinea*, and has given figures to show the appearances they present. He thinks that they spring up originally below or in the thickness of the cuticle, and consist of small articulated filaments containing sporules. The author endeavoured to propagate the disease by introducing the sporules into his arm and scalp, but he did not succeed in causing the plants to germinate on parts different from those which originally produced them. A plant of a similar nature, and nearly allied to the *Penicillum glaucum*, consisting of jointed filaments and sporules, was detected by Dr. Bennett in the lungs of a man who died of tubercular consumption. The vegetations were not only seen on dissection, but likewise in the sputa freshly expectorated during life; and, from the observations of Dr. John Hastings, it would appear that the presence of this plant invariably accompanies the expectoration of softened tubercle. A similar structure has also been seen in the sordes collected on the teeth and gums of persons labouring under typhus fever.

Dr. Bennett* considers that the pathology of *tinea favosa* is best understood by considering it as a form of scrofula, supposing this term to indicate a peculiar state of the constitution accompanying tubercular deposition in one or other of the animal textures; that in this particular disease the tubercular effusion takes place amongst the cells of the epidermis, and there constitutes a soil for the germination of mycodermatous plants, the presence of

* *Edinburgh Medical and Surgical Journal*, June, 1843.

which is pathognomic of the disease. He considers the chief indications of treatment are—first, to remove the scrofulous disposition; and secondly, to employ such topical applications as tend to prevent the development of vegetable life; and he observes that these may be chiefly fulfilled in the external and internal use of the cod liver oil.

About two years since Mr. Goodsir detailed a case, in which fluid was vomited periodically, containing what he believed to be vegetable organizations, and to which he gave the name of *Sarcina ventriculi.*

Mr. Busk* details three other cases, but is disinclined to believe that the so-called *Sarcina* is of the nature of a vegetable parasite; he says they appear in some measure to partake of the character of a ferment; but whether they are modified epithelial cells of the stomach, or are a peculiar secretion, remains an interesting subject for inquiry, as are also the conditions under which they occur and their chemical composition.

As throwing some light upon the curious subject of these adventitious productions, it may be mentioned that MM. Andral and Gavarret, in the course of their researches upon the blood, have discovered, that if the alkalinescence of its serum be neutralized by an acid, rounded corpuscles are developed in the midst of the fluid, which are no other than the first rudiments of a plant, having the greatest analogy to that pointed out by Mr. Toynbee in certain fluids after fermentation. They have found the same

* *Microscopic Journal*, January, 1843.

plant in the white of egg, in different serums produced by diseases, and in the serous part of pus.

The incompatibility of the existence of certain diseases with each other has been generally entertained—an opinion which John Hunter affirms, when he states, that no two actions from two different morbid poisons can go on at the same time, in the same part, in the same constitutions. Later observations, though not altogether bearing out this law, have yet shown that some diseases may suspend or modify the course of others. This subject has been particularly investigated by Professor Rokitanski, whose ample opportunities of observation give a weight to his conclusions; he asserts* that typhus is excluded by the various forms of puerperal fever, as well as by the pregnant state, childbed, and even, though in a less degree, by suckling. Typhus and cholera, typhus and dysentery, have the power of mutual exclusion, and the co-existence of tuberculous disease and typhus is extremely rare. Carcinoma and tuberculosis are antagonist diseases, and the latter and all kinds of serous cysts are never met with simultaneously in the same organ, or even in the same individual. Tubercular disease affords an immunity from cholera, dysentery, hypertrophy of the heart, curvature of the spine, dilated bronchi, and almost all chronic diseases of the stomach. Tuberculosis and aneurism do not co-exist; and Rokitanski, as well as others, have remarked, that the development of tubercle is arrested, although the disease is not subdued, by the pregnant state, or large tumours of the abdomen.

* *London and Edinburgh Medical Journal,* Febuary, 1843.

PRACTICAL MEDICINE.

Quinine.—The employment of this medicine in some of the old affections in which it has been administered, as well as in some new diseases, has been particularly studied.

Dr. Fantonetti* has adopted its use with success in cases of hæmoptysis, when accompanied by intermittent or by previous illness. Mr. B. N. Hogan recommends it in asthma. Dr. Guastamacchia advises its external application to the spine, in the form of a spirituous embrocation, during the cold stage of intermittent fever. Signor Broqua having suggested the employment of frequent doses in typhus, M. Laurent presents a summary of its effects when so administered, from which it appears that the most marked influence of the remedy was on the pulse, the frequency of which it uniformly diminished. Many unpleasant symptoms resulted during its employment, such as a dryness and heightened colour of the tongue and fauces, which probably prevailed thoughout a great part of the alimentary canal, being accompanied with intense and sometimes insatiable thirst; pain in the chest and epigastrium; abundant diarrhœa, and occasionally bloody stools; frequent vomitings, which ceased on abandoning the use of the remedy; deafness and ringing in the ears, which did not invariably cease with the cessation of its employment, &c. Though out of eleven cases of typhus, in which the sulphate of quinine was used, only one terminated fatally, yet M. Laurent is by no means sanguine of its being superior to other remedies in this disease.

* *Giornale della Pathologia et della Teraputica.*

M. Devergie and M. Briquet have suggested the employment of large doses in acute rheumatism, the former to the extent of five grains four times a day, and the latter to the amount of from four to six scruples in the twenty-four hours on the first day, reducing it to two scruples per diem for six or eight days. In a report of the Academy of Medicine* these excessive doses are condemned; and M.M. Recamier and Husson have detailed cases in which death clearly followed their administration. Moreover it is affirmed that equal therapeutic effects are produced by small doses.

Dr. Kingdon has succeeded in forming preparations of the iodide and biniodide of quinine. The latter preparation, though sparingly soluble in cold, is soluble in boiling water, readily soluble in alcohol, and then not precipitated when mixed with water. He has given it in many cases of scrofulous enlargement of the glands with very good success.

Iodine.—The effects of iodine and its salts are still engaging the attention of practical physicians. Mr. Copeman recommends it in the albuminous dropsy, after scarlet fever. Dr. Aubrun reasserts the efficacy of iodide of potassium in rheumatism, stating that in feeble subjects it may be trusted to alone, without any previous bleeding; but in plethoric patients it is better to begin the treatment with one or two large bleedings, and not to employ the iodide until towards the end of the second week. The patients treated in this way are less liable to suffer from rigidity of the muscles and

* May 9, 1843.

swelling of the joints—a not unfrequent occurrence in this disease, and the removal of which is so difficult. M. Bouyer says, that iodine combined with the syrup of poppies is a remedy of confirmed utility in the treatment of cases of chronic periostitis, chronic articular, and sometimes acute rheumatism, more especially if in this latter it has been preceded by antiphlogistics which have only proved of partial or no benefit. Dr. Langevin details cases exemplifying its beneficial effects in syphilis; and Mr. Fludyer mentions its employment in acute hydrocephalus. M. Boroch has found a modification of Lugol's solution, applied externally, efficacious in old standing and tedious cases of herpetic pruritus, applied externally. M. Steenkiste has treated, with success, an obstinate case of leucorrhœa by the local application of iodine; and Dr. William Davidson has used, with advantage, the ioduret of sulphur in the form of an ointment, in cases of porrigo, when other treatment has failed.

Mr. Donovan has continued his researches on the use of the liquor of hydriodate of arsenic and mercury, and its efficacy has been very fully substantiated by the authority of some of the most accomplished physicians of the sister island.

In a previous page we have alluded to Dupasquier's exhibition of the salts of iodine in consumption. We also find M. Gilbert Boissiere stating iodine to be not only innocuous but of great utility, and that there is no remedy to be compared with it; but for a full and complete account of its action we would refer to the memoirs of Mr. Erichsen,*

* *Medical Gazette*, May, 5, 1843.

and, more especially, of M. Ricord.* This latter, who has particularly studied the morbid phenomena which depend purely and solely on the action of the iodide of potassium, states, as a positive practical fact, that they do not require for their removal any other treatment than the suspension of the medicine for a few days, or the diminution of the doses in which it is administered.

Dr. Patterson,† in a paper in which he states that nitrate of silver immediately on its exhibition is decomposed in the stomach and becomes a chloride—a view in which he follows Mr. Lane—says the discoloration of the skin is most probably owing to the decomposition of the chloride of silver circulating in the cutaneous tissue through the chemical action of the sun's light, and the deposition there of its metallic basis. In order to obviate this he suggests that in place of the nitrate of silver or the muriate, as advised by Dr. A. T. Thompson, or the oxide by Mr. Lane, the iodide should be administered, as he finds it capable of resisting the chemical action of light, and that therefore the probability of its causing discoloration of the skin is rendered distant. He details experiments and cases which appear to confirm the correctness of this opinion; and Dr. Graham‡ reports a case in which the external and internal employment of the iodide of potassium, in blue discoloration of fourteen years standing, has had considerable effect in modifying the colour. The blueish leaden hue has been partially changed

* *L'Experience.*

† *Dublin Medical Press,* August 25, 1842.

‡ *Ibid,* February 1, 1843.

to a more brown tint, and the skin has become, to a certain extent, lighter. In some parts of the face the discoloration has been materially lessened, and the natural colour of the skin has in some degree become perceptible.

Bromine.—Dr. Glover* has studied the physiological and medicinal properties of bromine: he considers the solution of bromine in water an elegant and useful application to scrofulous, syphilitic, and specific ulcers, also to eczematous eruptions, and gives cases to prove that the bromide of mercury will cure syphilis as well as the chloride; but that, contrary to what has been asserted on the continent, it is likely to give rise to disagreeable symptoms. The bromide of iron he regards as an excellent general tonic, sitting easier on the stomach than any of the strong preparations of this base. His general conclusions are that, physiologically, bromine and the bromides are nearer the group of chlorine and chlorides than that of iodine and iodides: he maintains that their chemical and physiological relations are alike, and that the same is true of their medicinal properties.

Creosote.—Though this medicine has not generally speaking answered the expectations which were first formed, we yet find that its merits are occasionally dwelt upon. Mr. Whitwell speaks highly of its curative effects in purpura; and Dr. Cormack, in following out his observations published in 1836, states that he has now satisfied himself that

* *Edinburgh Medical and Surgical Journal*, July and October, 1842.

in large doses it is a narcotico-acrid poison, and that it resembles prussic acid in its sudden depressing action on the heart, as well as in the temporary nature of its toxicological operation; that in medicinal doses it is almost immediately sedative and calming, but these effects are of short duration; that in cases of vomiting it is one of the best medicines we possess; that it is useful in arresting hæmorrhage, in neuralgia and phthisis in the form of vapour, and as an external application in toothache and phagedenic ulcers; and that it appeared to be injurious in diabetes, dyspepsia, rheumatism, irritable bladder, and cancer.

Naphthaline.—The application of naphthaline, in the form of an ointment, has been recommended by Emery in cases of psoriasis and lepra; and the bisulphuret of carbon, externally or internally applied, is said to be useful in rheumatism, glandular enlargements, neuralgic pains of the face, &c.

Some preparations of potassa and soot, and potassa and coal, to which the extraordinary names of fuligokali and anthrakokali have been given, are stated, by Drs. Polya and Gibert, to be useful in skin diseases.

Ammonia.—M. Ducros says that the application of ammonia at 25° R. over the back of the cervical vertebræ, and opposite the pharyngeal plexus, is capable of arresting, in a majority of cases, attacks of nervous asthma; and Mr. Smee recommends the direct inhalation of diluted ammoniacal gas in various affections of the throat, but observes that the

presence of inflammatory symptoms, local or general, counter-indicates its use. Dr. Bartels recommends the hydrocyanate of zinc in various forms of nervous affection, as epilepsy, hysteria, &c.

Oils.—Since the publication of the observations of Drs. Bennett, Ascherson, and Klencke, on the virtues of cod liver oil, endeavour has been made to obviate the nauseousness of its taste. Mr. Ure says that he has entirely prevented its objectionableness in this respect, by using the cod livers themselves and mashing such oil as escapes with potatoes. MM. Girardin and Preisser suggest the employment of the liver of the skate, not only from the oil being less disagreeable to the taste, but because it contains a larger quantity of the iodide of potassium than that of the cod. We must however conclude that the efficacy of this remedy has been much overstated; for we find Dr. Stacques, of Ghent, asserting, and his opinion must have some weight, that he is in possession of no fact in which, upon analysis, he is entitled to ascribe the good effects said to result from its use to the oil alone.

Dr. Clay speaks favourably of the use of ox gall, more especially in those cases in which deficiency in quality and quantity of bilious secretion is the prominent and prevailing derangement.

Dr. H. Roe recommends the use of castor oil and turpentine in anæmia with chlorosis; and Dr. Franz has followed up a suggestion of Dr. Trusen, of Posen, in the external application of croton oil in hoarseness, with the greatest success. He details several cases of various complexion, in each of which its application was satisfactory.

Indian Hemp.—The medical properties of the Indian hemp are attracting particular attention, from Dr. O'Shaughnessy having lately imported a quantity into this country. Mr. Ley and Dr. Clendinning have both studied its effects, and speak most favourably of it as a narcotic and anti-convulsive remedy; and the latter says his experience has satisfied him that the hemp extract is possessed of medicinal properties sufficiently energetic and uniform to entitle it to admission into our national Pharmacopæia. The observation of Dr. Farre, however, deserves attention, that the *Apocynum cannabinum*, an inert substance, is often substituted for it.

Acids.—Mr. Benson, following out the idea pursued in a lead manufactory in France, has invented a sulphuric acid beer, to obviate lead colic, with the most effectual success.

Dr. Trusen has found mineral acids of universal benefit in dropsy not dependent on disease of the respiratory organs, or extensive disorganization of the liver. The principal medicines of this class he employed were the acid-elixir of Haller and phosphoric acid. The former is useful in dropsies of an adynamic character, those consequent on intermittent fevers, and those due to checks of the perspiration or other secretions. The phosphoric acid is suitable in cases of dropsy owing to an altered condition of the blood, and in those supervening upon diarrhœa, dysentery, chlorosis, &c. Dr. Barach recommends the external use of the acid-elixir as a rubefacient in painful neu-

ralgic affections; he used it four times diluted, and rubbed in night and morning.

Chlorine.—The use of chlorine has been recommended in scarlet fever, and, from the reports, its exhibition has been attended with success. Dr. Hunt recommends the chlorate of potash in cancrum oris and phagedena of the cheek, in doses of one or two scruples in the 24 hours.

Mercury.—Mr. Murray,* in a paper on the direct and primary action of calomel, has added some little to our knowledge of this remedy: he shows, from experiments on dogs, that, in moderate doses, it excites an afflux of blood to the minute arteries and capillaries of the gastro-intestinal mucous membrane, more particularly the gastric and colic portions, imparting to it a capilliform, punctiform, or uniform red tinge, &c.; that it increases the flow of bile into the duodenum and the secretions from the intestinal mucous follicles and serous exhalants; that in inordinate doses, (1, 2, 3 drachms,) in addition to the above, capilliform injections of the serous coat of the intestines and a morbid sanious discharge from the mucous follicles.

Ergot of Rye.—The therapeutic uses of the ergot in other cases than as an adjuvant to labour are thus summed up by Dr. Bernhard Ritter, of Rottenburg:† Its use is indicated in cases of hæmorrhage, and especially in uterine, utero-placental, and puerperal hæmorrhages; in critical epistaxis and hæmoptysis,

* *Transactions of Medical Society of Bombay.*

† *Medicinische Annalen.*

and as a prophylatic against uterine hæmorrhages in women who have lost much blood in previous labours. In this last-named case, the ergot is given in the dose of a scruple to half a drachm about a quarter of an hour before the expected birth of the child. It is also indicated in amenorrhœa and dysmenorrhœa, arising from torpor of the uterine functions, in vaginal blenorrhagia, chronic idiopathic leucorrhœa, not dependent on a venereal cause, and for the expulsion of moles and uterine polypi, or at least to propel them, so that they can be seized. The ergot is also recommended in intermittents when unaccompanied by phlegmasia, and in chronic diarrhœa.

Zinc.—Dr. Strong has recommended the use of sulphate of zinc in flatulent affections of the colon and in constipation.* He uses it in three grain doses in cases attended by borborygma and distension, and regards its action as essentially astringent. It should be taken immediately after a meal to obviate sickness.

Benzoic Acid.—Mr. Ure† says that in benzoic acid the hitherto embarrassing problem is solved of rendering an alkaline urine acid at pleasure, and consequently of obviating the irritation which such urine occasions to the membranous surface with which it comes in contact. This very important position is evidenced in an interesting case in which the deposition of phosphates, uncontrolable by other means, was immediately arrested by this

* *Edinburgh Medical and Surgical Journal*, October, 1842.

† *Medical Gazette*, February 10, 1843.

remedy, and the patient, fast sinking beneath his malady, was restored to health. The presence of hippuric acid, into which the benzoic acid is converted, prevents for a considerable period the putrefaction of urine.

Potato.—The use of the potato in scurvy has come under discussion during the last year. Sir G. Blane, Mr. Smith, J. Fontanelle, and Mr. Dalton, had previously called attention to its use, in the raw condition, while Mr. Berncastle and Dr. Baly* have shown that its virtue is not destroyed by boiling. The latter gentleman has fully proved its efficacy in averting the presence of this disease in the Milbank Penitentiary. He refers its antiscorbutic quality to the ample presence of an acid, supposed by Eintroff to be the tartaric, and by Vauquelin, the citric, in combination with potash and lime.

White Hellebore.—Dr. Dornbluth recommends, as a cure for psora, the external use of white hellebore, in the form of a liniment. He speaks of its success as being uniform and extensive, and recommends it in preference to other remedies, not only from its curative powers, but from its not smelling, nor requiring internal treatment.

Aconite.—Dr. Busse recommends aconite both in acute and chronic rheumatism, more particularly from its not exciting the vascular system.

M. Rougier advises, in neuralgia and sciatica,

* *Medical Gazette*, February 10, 1843.

the muriate of morphia applied endermically; the surface is vesicated by a hot iron, and the morphia, from a grain and a half upwards, previously wetted, applied.

Amongst the numerous remedies which are daily being suggested for the cure of epilepsy, we find Dr. De Losch recommending the use of sulphate of copper, and M. Podrecca, indigo combined with castor and assafœtida.

In three epidemics of hooping cough, Dr. Rieken* says that he has derived more advantage from the use of assafœtida than from any other remedy. Its use is indicated only after the febrile period has passed, and its influence is diminished in the third stage, when tonics should be combined with it. He generally administers it in the form of an enema. In the third stage of this disease Dr. Geigel recommends the exhibition of tannin, and Dr. Sebregondi confirms its utility. Dr. Wachtel † has largely tested the old English remedy of cochineal and speaks very favourably of the results. He observes that from its disposition to putridity no more should be dissolved than is required to last from 36 to 48 hours.

Mr. Griffith ‡ and others have published cases showing that the local use of tartar emetic or croton oil may produce irritating effects on the genital organs, and Dr. Boas has observed an analogous effect produced by assafœtida plaster. In men, tumefaction of the scrotum often occurred; in women,

* *Annales de la Societé Medicale de Bruxelles*, September 3, 1842.

† *Medicinische Yahrbucher*, October, 1842.

‡ *Provincial Medical Journal*, November, 1842.

tumefaction and even inflammation of the external labia. In one case, that of a woman 50 years of age, where the plaster had been applied on the abdomen, very troublesome inflammation of the external organs of generation, requiring an antiphlogistic treatment, supervened, and the mammæ became greatly enlarged, and furnished a milky secretion in considerable quantity.

Dr. Bückner states that the topical application of the leaves of the *Betula Alnus* is much resorted to in Stadt-Steinach, to cause the cessation of the lacteal secretion, and the resolution of tumours of the breast in women who do not suckle, and in those who wish to wean their children.

M. Negrier* has promulgated the curious fact that bleeding from the nose may be immediately arrested by the elevation of the arms, with simultaneous pressure upon the nostril. He relates several cases where the epistaxis readily yielded to this remedy; and Mr. Davie, of Haddingham, reports an aggravated case which was likewise successfully treated by this method. M. Negrier offers the following explanation: when a person stands in the ordinary posture with his arms hanging down, the force needed to propel the blood through the upper extremities is about half that which would be required if the arms were raised perpendicularly above the head. But since the force which sends the blood through the carotid arteries is the same as that which causes it to circulate through the bronchial arteries, and there is nothing in the mere position of the arms above the head to stimulate the heart to in-

* *Gazette Medicale.*

creased action, it is evident that a less vigorous circulation through the carotids must result from the increased force required to carry on the circulation through the upper extremities.

FORENSIC MEDICINE.

The journals of the past year have, in many departments of this branch of medicine, added considerably to our information.

Arsenic.—With regard to the habits of that most important of poisons, arsenic, in the human body, and its detection, our knowledge is being completed to the highest state of certainty.

It now appears established that the view, which was promulgated three years since by Orfila, of the human tissues in a state of nature containing this mineral, as likewise copper and lead, is incorrect. Another point of discussion between this chemist and his pertinacious rivals, M.M. Flandin and Danger, has also been tested by M. De la Fond, viz.: the influence of poisoning by arsenious acid upon the urinary secretion, who concludes, that this secretion, though greatly diminished, is not suppressed, and that it contains a notable quantity of the poison. It is also now decided that the blood and some of the chief organs of the body may contain portions of the metal even after all traces of it have passed away from the stomach; but that the liver is the organ which it particularly affects. Mr. Taylor* reports a case of rapid death from acute poison-

* *Guy's Hospital Reports*, October, 1842.

ing by this substance, in which it was detectable in the liver, but not in the blood or in the spleen; and Mr. Herapath detected it in the liver, when undiscoverable in the stomach. It therefore becomes a matter of serious importance, in investigations of the cause of death from poisoning, to analyse the contents of this viscus.

MM. Chevalier and Barse have published a memoir in which the merits and mode of application of Marsh's test are fully canvassed; and M. Meillet, in reviewing its operation, has shown that it is not applicable if the sulphuret be the salt of arsenic present; and consequently, if much sulphuretted hydrogen were formed, the whole of the arsenic present would be converted into sulphuret, and the spots obtained yellowish. Independently of this, there can be no doubt that the minuteness of analytical chemistry has thrown some little trouble in the way of Marsh's very beautiful test, from the too great probability of the presence of some small quantity of arsenic either in the zinc or sulphuric acid required for the generation of the hydrogen. It is therefore, with the greatest satisfaction, we record a method proposed by Hugo Reinsch* for its detection. This process consists in acidulating the arsenical fluids with muriatic acid, and boiling them with metallic copper, which then becomes covered by a steel-grey crust of metallic arsenic. This test is rendered more valuable by being applicable to organic fluids. M. Reinsch conceives that, compared with Marsh's method, his own enjoys the following advantages. Its execution is easier and

* *Repertorium für die Pharmacie,* vol. xxvii., p. 13.

requires less time. It cannot give rise to errors, because the arsenic can be obtained at first in the metallic state, then in the form of arsenious acid, and again in the metallic state on a plate of porcelain without any loss. It is exempt from the inconvenience of frothing of liquids, the carbonization of tissues, &c. It equals Marsh's method in point of sensibility, since we are able by it to detect a millionth part of a grain of arsenic in a fluid.

To the value of this test we shall quote the opinions of Dr. Christison and Mr. Taylor. The former says* that he has obtained from it the most satisfactory results. In medico-legal investigations he considers it superior to any other in point of convenience, where complex fluids or mixtures of organic solids are to be examined—and a process which, on the whole, is likely to supersede all others hitherto proposed. Mr. Taylor† says, among the obvious advantages of this test are—first, its extreme simplicity and the consequent facility with which it may be applied; and secondly, the rapidity with which an analysis of the most complex solid or liquid may be performed. Indeed the analysis of the contents of the stomach of a person suspected of having died from arsenic may now as it were form part of the *post mortem* examination. It will detect and separate a smaller quantity of arsenic than we shall probably ever have to encounter in a medico-legal analysis; and it is far more easy to obtain arsenious acid from a minute quantity of the metal than to obtain the metal from the reduction of a minute quantity of the sesqui-sulphuret, accord-

* *Edinburgh Medical and Surgical Journal*, 1842.

† *British and Foreign Medical Review*, July, 1843.

ing to the process commonly adopted. Further, there is as much certainty in this as with Marsh's test or other modes, and where it fails it is pretty certain that no other test will succeed.

The question in dispute upon the distinctive characters of arsenical and antimonial spots is equally applicable to this process of Reinsch as to that of Marsh, and it therefore now becomes doubly necessary to be clear upon this matter. Independently of its having been shown that the arsenical spots are soluble in the chloride of soda, which is not the case with those of antimony, Mr. Watson* has proposed a test dependent upon the difference in volatility of these substances:—crusts of metallic arsenic and of antimony, on slips of glass, are inclosed in test tubes and immersed in boiling oil; in one minute the arsenic disappears from that part of the glass surrounded by the hot oil, which will not be the case with the antimony until after the expiration of seven minutes. Wackenroder has proposed several methods to secure accuracy; the only one which need be noticed depends on the crystalline form of arsenious acid. A metallic film having been produced, the tube, open at both ends, is held in a slanting position, and the ring is heated; a deposit is produced some distance from the place where the ring was, and which may be either arsenious acid or oxide of antimony. The tube is carefully broken, and one of the pieces brought under the microscope with a magnifying power of 900. If the crystals are regular octohedrons, they are arsenious acid; but if prismatic, oxide of antimony, this oxide never forming octo-

* *Memoirs of the Philosophical Society*, Manchester, vol. vi.

hedral crystals, but only prisms. Notwithstanding the certain assurance of Wackenroder, I am inclined to think the attempt to decide the nature of the grey metallic spots from their external characters alone will not be found satisfactory, and that therefore they should be further subjected to chemical examination.

Corrosive Sublimate.—M. Mialhe* says he has discovered from experiments that hydrated protosulphuret of iron, a perfectly innocuous substance, instantly decomposes corrosive sublimate; it is equally useful in counteracting the deleterious operation of several other metallic salts, especially those of copper and of lead. According to the experiments of MM. Sandras and Bouchardat, the best antidote to corrosive sublimate is the hydroguret of iron. But as there is great difficulty in preserving this substance, the authors think that the persulphuret of the hydrate of iron is preferable. In poisoning by the acetate of copper, they recommend the administration of the persulphuret of the hydrated peroxide of iron; given even after an interval of forty minutes, when symptoms of poisoning had already commenced, this preparation has sufficed to check their progress. With regard to the salts of lead, the authors have instituted no experiments, having seen dogs get well without any especial treatment after the administration of this class of poisons. The antidotes to arsenious acid are the peroxide of iron and the persulphuret of the hydrated peroxide of iron. This latter substance is thus found to be suit-

* *Academy of Medicine,* August, 1842.

able to many different kinds of poisoning, and is, therefore, a very valuable preparation; it may always be administered, even where we are doubtful as to the nature of the poison.

Lead—M. Chevalier* relates a case of poisoning by lead in cider, which is chiefly interesting from his announcing the fact, that the malate is a soluble salt, contrary to the opinions of Thomson and Berzelius.

Professor Otto, of Copenhagen, details two cases where symptoms of poisoning were induced, apparently, by the use of Macaba snuff, adulterated by red lead. The snuff, on chemical examination, was found to contain from 16 to 20 per cent. of lead.

Copper.—M. Degrange† records a case of poisoning by native verdigris, the deuto-subcarbonate of copper, which is chiefly remarkable for the absence of alvine dejections and vomiting, freedom from tenderness of the abdomen, and for the presence of apoplectic symptoms. A *post-mortem* examination showed decided congestion over the whole surface of the brain, with inflammation and ulceration of the stomach, a green tint of the whole bowels, which was not the produce of putrid decomposition, and in several parts of them ecchymosis, with blackish spots and vascular ramifications. By analysis it was found that copper pervaded the whole alimentary canal, was discoverable in the urine, but not in the blood or heart.

* *Annales d'Hygiene Publique*, January, 1842.

† *Journal de Medecine pratique de Bourdeaux.*

Phosphorus.—M. Lafarge* relates the case of a child, six months old, who died from sucking the ends of lucifer matches: the symptoms were violent vomiting, the matter ejected being luminous and, as well as the breath, emitting a strong phosphorescent odour; coma and convulsions supervened: on examination after death the pyloric orifice of the stomach and the whole course of the ilium exhibited patches of thickened and softened mucous membrane.

M. Orfila† has contributed some valuable papers on the absorption of vegetable and mineral acids, metallic salts, and fixed alkalis, into the system. It is impossible to give anything like an analysis of these papers; we may however observe, that the question is one of great importance in a medico-legal point of view, as they show that it may be incumbent on the chemist to carry his researches into organs situated at a distance from the stomach. M. Orfila has satisfied himself that traces of the acids can be discovered in the urine of persons poisoned, but not in the liver or spleen; of the metallic salts and fixed alkalis, in the urine, the liver, and the spleen; but that evidence of the exhibition of these latter is rather to be found in the alimentary canal itself, and in the disorganisation consequent upon their presence.

Hydrocyanic Acid.—M. Morin‡ gives notice of a case in which it was decided that an individual had been poisoned by hydrocyanic acid, from the smell

* *Provincial Medical Journal,* December 24, 1842.

† *Journal de Chimie Medicale.*

‡ *Bibliothéque Univ. de Genève,* December, 1842.

pervading all the organs after death. This conclusion became the matter of investigation, and the result arrived at agreed with that promulgated by Orfila, namely, that smell was not sufficient to decide the question; for in several cases no such smell was detectable, though death had been produced by large doses of the acid; and, because it appears highly probable, that both during life and after death, this acid may be generated in the human body. Moreover, M. Bonjeau has ascertained that animal substances distilled in a sand-bath in water, at a temperature of 212° to 248° Fahrenheit, will sometimes yield a small quantity of prussic acid combined with ammonia.

Opium.—MM. Larocque and Thibierge* have carefully examined the proposals of Dr. Christison for the discovery of opium in organic fluids; and they come to the conclusion that iodic acid ought to be used as a reagent for morphia with the greatest circumspection; that the re-agents most deserving of confidence are nitric acid, the neutral perchloride of iron, and the perchloride of gold; with these the presence of morphia, which had been mixed with beer, soup, or milk, has been ascertained; and it is also easy to show the presence of meconic acid in these fluids, especially when the meconate of lead has been decomposed by weak sulphuric acid.

Alcohol.—Dr. Christison† has shown the possibility of detecting alcohol in the stomach, even three months after death. The process of analysis con-

* *Journal de Chimie Medicale.*

† Edinburgh Medico-Chirurgical Society, January 4, 1843.

sisted in cautious distillation from carbonate of potash; neutralization of the distilled fluid with sulphuric acid to remove ammonia; re-distillation till a fifth of the fluid passed over; and agitation of the new distilled liquor with dry carbonate of potash.

Dr. Page, of Valparaiso, and Dr. Cazentre, report cases of poisoning by cubebs, in which, by analysis, no deleterious properties could be found; the symptoms during life and the examination after death were indicative of inflammation and congestion.* Dr. Wolfring relates a case of poisoning by squills.† Dr. Dawosky details a case of poisoning by digitalis, which is interesting from the symptoms coming on after twenty days' use of moderate doses: and Dr. A. T. Thomson one by colchicum; the symptoms were fall of pulse, both in force and frequency, cold clammy sweats, wild delirium, and maniacal stare; the morbid appearances on dissection were increased vascularity of the arachnoid, a deposit of grumous blood in the colon, and small triangular points, surrounded by greenish-coloured bands and lines, in the interior of the liver. Dr. Lieber relates cases of poisoning by decayed carrots: the symptoms were violent vomiting and convulsions, with a quick and full pulse.‡ Dr. Poumet has entered largely into the examination of poisoning by cantharides; and he comes to the conclusions: 1. That the presence of cantharides, administered internally, either entire or in fine powder, may

* *Lancet*, February, 1843.

† *Chemist*, October, 1842.

‡ *Schmidt's Yahrbücher*, August, 1842.

be demonstrated in the vomited matters, in the fæces passed during life, in the mucus of the œsophagus, in the contents of the stomach and large and small intestines, in the matters formed in the margin of the anus, and on the internal surface of the insufflated, stretched, and desiccated alimentary canal. 2. That the traces of the poison may be discovered and recognized six months after death. 3. That the shining particles of the Spanish fly cannot be mistaken for red or copper filings.*

Tannin has been recommended by Dr. Meyer as an antidote to cicuta, and by Chauserel† to poisonous mushrooms, on the ground of its forming an insoluble combination with many vegetable poisons.

M. Mandl‡ has produced an elaborate paper on medico-legal researches on the blood, in which he shows that by the aid of the microscope it is possible to distinguish blood spots on linen, &c.

A number of cases are reported of that peculiar disease originated by eating spoiled meats, and often terminating in death. Dr. Sigg§ relates the history of a party of 600 who had eaten of spoiled ham, 550 of whom were attacked, nine died, and all, who had severe attacks, lost their hair. Dr. Röser‖ relates the case of a family of eight, who were poisoned by liver sausages, which had become sour, three of whom died; and Dr. Pollias mentions nine persons who were poisoned by a kind of strong cheese.¶ It would appear that the characteristic

* *Annales d'Hygiene Publique*, October, 1842.

† *Wackenard Archives de Physiologie.*

‡ *Gazette Medicale de Paris*, September 3, 1842.

§ *Ibid*, July 2, 1842.

‖ *Schmidt's Yahrbücher*, August, 1842.

¶ *Chemist*, December, 1842.

lesions after death in these cases were inflammation and disorganization of the mucous surfaces, more especially of the pharynx, a leaden colour and broken down character of the liver, and a large and softened spleen.

STATISTICS.

The Registrar-General has published his fourth report on the births, deaths, and marriages, in England and Scotland. It would obviously be impossible in the present retrospect to give an analysis of this work; we may, however, briefly mention that it refers to the state of the population in 1840, a year characterised by a temperature rather higher than that of the four years immediately preceding; that the mortality of this year was above the average, the summer and autumn months being the most fatal; that the diseases that swelled the amount more particularly were scarlatina, which was the prevailing epidemic, and from which the deaths were nearly four times more than in 1838, diarrhœa, cholera, influenza, ague, and dropsy; that the deaths from small-pox, typhus, hooping cough, and hydrophobia, were rather below the average of previous years.

The Statistical Society of London have formed a committee, to inquire into the progress of diseases and causes of death in the public hospitals, &c., of the metropolis, and have issued their first report, which consists chiefly of directions. We trust that it is now in full operation, and have no doubt that some interesting results may be obtained from it.

Drs. Omond and Maclagan, in a third and elaborate report on the diseases of Edinburgh, drawn from 3044 cases occurring during the past year

in the New Town Dispensary, affirm, as regards the locality of fever, that though the history of any one year, viewed apart from the others, may indicate its prevalence in a particular locality, yet the more extended observation of three years fails to discover any one district as peculiarly liable.

Dr. Guy has contributed an article to the Journal of the Statistical Society,* purporting to show the influence of the seasons and weather on sickness and mortality; from which it appears that the atmospheric conditions, following the same order as the amount of sickness, are the temperature and the dew point; that the dew point, however, is merely a coincidence, and that the quantity of moisture in the atmosphere has no relation to the prevalence of sickness; so that the atmospheric condition, which exercises the most marked influence on sickness and mortality, is temperature.

Dr. Joslin† has examined the influence of season on spontaneous hæmorrhage, as exemplified in the occurrence of hæmoptysis and uterine hæmorrhage. The months in which the greatest number of cases occur are June and September; hæmoptysis in the former, and uterine hæmorrhage in the latter. From this and other data he infers, that neither the extremes of heat nor of cold are among the most influential causes, and that the atmospheric condition of the period preceding a storm is more conducive to hæmorrhage than that which immediately succeeds one.

Dr. John Webster has contributed a paper on the statistics of insanity, compiled from the registers

* January, 1843.

† *Quarterly Journal of Meteorology*, July, 1843, from *American Journal.*

of Bethlehem Hospital for the last twenty years; according to which it appears that there are admitted 47 per cent. more women than men; that cure was effected in females in 55.14 per cent., and in males in 46.20 per cent., thus giving a preponderance in favour of the former of 8.94 per cent. The number of deaths also among the male patients was 6.25 per cent., and only 4.25 per cent. among the females. The author therefore concludes that insanity is not only more common among women than men, but also a more curable disease; so that, *cæteris paribus*. the prognosis may be considered as more favourable in female than male patients. The diminished rate of mortality and the greater proportion of recoveries are also clearly shown by the records of the institution; since it appears that during the three years ending the 21st of December, 1752, the proportion of patients discharged cured was only $31\frac{1}{4}$ per cent. on the total admissions, whilst for the three years ending December 31, 1842, the cures amounted to nearly 55 per cent. The ratio of deaths also during the former period was as high as $25\frac{1}{2}$ per cent., but only $5\frac{5}{8}$ during the last-named three years; that is about one-fifth of the amount reported nearly a century ago. The author next remarks on the diminished number of suicides in the insane patients admitted into Bethlehem, observing at the same time their greater frequency among females than among males. A synopsis is next given of 70 dissections recently made by Mr. Lawrence, in which the various morbid appearances met with are carefully detailed. The author concludes his paper with an allusion to the two sections of pathologists at present dividing the

opinions of medical writers respecting the alterations of structure met with in cases of insanity, viz., the "anatomists" and "vitalists;" the former considering them as causes, the latter only as consequences of the previous mental affection. In his opinion the theory of the anatomists is the more rational, and most in accordance with the present state of our knowledge of the pathology of mania.

M. Leuret has also published a statistical account of insanity from the cases occurring in the Bicêtre; and Mr. Hare, from those in the Retreat, near Leeds.* The details of these papers are too minute and extensive to be quoted here; they will, however, amply repay a perusal.

MEDICAL BIBLIOGRAPHY.

Though medical literature during the past year has not received any addition of great or stirring novelty, yet it offers for notice several works and papers of considerable interest.

The local reports of the sanitory condition of the labouring population of this country abound in a mass of information which has been digested by Mr. Chadwick, the secretary to the Poor Law Commissioners, into a general report. The volume in which this latter is comprised, is one of peculiar value, and has been very justly styled by an eminent reviewer† as "constituting the most valuable and complete treatise on certain departments of medical police" ever published either in this or any other country. It must not be forgotten that the conception and carrying out of these inquiries

* *Provincial Medical Journal*, June, 1843.

† *British and Foreign Medical Review*, July, 1842.

are owing to one who is not a member of the medical profession, and that in bringing them to a conclusion Mr. Chadwick has proved himself equal to the task so well conceived.

On the subject of medical biography we have two works, the one a life of the late Dr. James Hope, physician to Saint George's Hospital, which lays open to us the career of an arduous investigator of disease, and one on whom the principles of the Christian religion appear to have made the deepest impression; the other of Sir A. Cooper, from the pen of his nephew, Mr. B. Cooper, which though not a work of a high philosophical tone, yet abounds in amusing incidents of this distinguished man's career.

The subject of insanity has occupied much attention. In a small volume Dr. Pritchard has given us a very succinct and useful digest of his views "on the different forms of insanity in relation to medical jurisprudence," which. though ostensibly addressed to the legal profession, will be found of value to the medical man.

The admission of students to the wards of establishments set apart for lunatics, and the clinical lectures of Dr. Sutherland at Saint Luke's, are evidence that a new and enlarged system of education on mental diseases has commenced; as the reports of Dr. Conolly, of Hanwell, of Dr. Browne, of Dumfries, of Dr. Thurnam, of the Retreat, are of the extension of the more humane system of treatment which modern days have called forth.

The acquittal of M'Naughten for murder, on the plea of insanity, has aroused the indignation and excited the fears of the public for the course of public justice, and a statement of the position of the law as

regards such pleas has been called for from the judges of the land and duly responded to. In the answers to the queries submitted to them, the certainties and dignity of the law are fully sustained, and may probably remain so until the ingenuity of council shall set them at nought on the first occasion that offers.

Sir Alexander Crichton, the greater part of whose life has been passed in active practice at St. Petersburg, offers for observation perhaps one of the most remarkable works that has issued from the press for many years. At the age of 79 he publishes a volume, purporting to be commentaries on some doctrines of a dangerous tendency in medicine, and on the general principles of safe practice, which are not only valuable from the experience that a long life of useful observation has enabled him to exercise upon the various subjects of which he treats, but the manner in which this is done is evidence of an untiring energy rarely to be met with at so advanced a period of life—the newest and most abstruse philosophical views of the present day being weighed, digested, and applied. The commentaries comprise discussions on the functions of the heart and arteries, on typhus, insanity, and syphilis.

Dr. Bence Jones has produced a small volume on the application of Liebig's physiological views to the pathology of urinary and gouty diseases; and Dr. Walshe a manual on the physical diagnosis of diseases of the lungs, which is, perhaps, the most complete, and at the same time the most compendious, that has been ever offered for the consideration of the medical world.

Sir Henry Marsh has concentrated into a small pamphlet a collection of facts and observations on

the curious subject of the evolution of light from the living human body. The remarks on the luminousness attendant on the dying bed of some consumptive cases are very interesting.

Dr. Graves has brought together and re-published with considerable additions his very valuable lectures on clinical medicine, which have at various times appeared in the *Dublin Hospital Reports*, and the *Dublin Medical Journal;* this volume will be found replete with sound, and in many instances novel, practical information: it constitutes a work of great value.

Mr. Julius Jeffreys has published a very original volume on human statics; and Dr. Charles Loudon a "Solution du problèm de la Population et de la subsistence." The views of this author are chiefly Malthusian, and he discusses a plan calculated, as he thinks, to prevent population increasing beyond the means of subsistence.

The various medical reports and journals contain numerous papers of interest; it would be quite beyond our limits even to particularise them; we may however observe, that the *Medico-Chirurgical Transactions* and *Guy's Hospital Reports* are not deficient in their usual interest; that the *British and Foreign Medical Review* maintains the high character which the talents and industry of its editor have acquired for it, and that the very excellent and valuable retrospects edited by Mr. Braithwaite have been continued, the usefulness of which has only to be known to ensure them a place on the library table of every medical man. Nor must I omit to mention the establishing, on the continent, of a journal, the "*Annales Medico-Physiologiques,*" by Baillarger, Cerise, and Lorget, devoted entirely to

subjects connected with the nervous system; nor Dr. C. Canstell's annual report of the progress of medicine in general in all countries, the main feature of which is, its being divided into 36 different sections, and each section being written by an author celebrated in the peculiar province of medical science to which it is devoted.

Long as this paper has been I must not bring it to a close without some brief mention of those illustrious labourers in our profession, whose career has been terminated by the hand of death during the past year.

The first to whom I shall allude is the last of the "two Lathams," men who, it may be in the recollection of some that now hear me, the venerable Chancellor Pott, at the previous meeting of this Association in Exeter, appealed to as being of those whose opinions and career refuted the calumny that had been urged of the infidelity of the medical profession. The following interesting notice is taken from the *Medical Gazette*:—On the 28th of April last the venerable John Latham, "Father of the College of Physicians," breathed his last, at the very advanced age of 81. None of his immediate contemporaries are now alive, and his juniors by ten years are almost all passed away. He had himself long retired from the cares of the world, so that of the physicians now in active practice few could have known him; yet he was eminent in his time, and enjoyed a large share of the esteem and confidence of mankind. Half a century ago he was one of the physicians of St. Bartholomew's Hospital. At the age of 46, worn

out by the hard labour of his early success, he was believed to be consumptive, and retired into the country (it was thought) to die. But he recovered and resumed his profession; and removing from Bedford Row to Harley Street, he enjoyed, with a more moderate practice, a larger share of health than he had known during his days of greater labour and success. In the year 1814 Dr. Latham was elected President of the College; in 1816 he founded the Medical Benevolent Society; he contributed several papers on practical subjects to the *Medical Transactions;* in 1809 he wrote a small volume entitled *Facts and Opinions concerning Diabetes;* in 1829, having reached his 68th year, he finally left London. Fourteen years of life yet remained to him: for two-thirds of this period he enjoyed the comforts which are still within the reach of a vigorous old age; for the last was reserved the sharpest of all bodily afflictions—the formation and gradual increase of stone in the bladder. Under this he sank and died.

The fame of physicians, except the few in any age who have pushed forward the boundaries of physiological and pathological knowledge, does not outlive the recollection of those who knew them and have derived benefit from their skill and care. Those who knew Dr. Latham, both his fellow physicians and his patients, speak of him with great esteem and affection: his patients remember the confidence and encouragement which accompanied his address, his sincerity, his straightforwardness, his liberality; and there are physicians now grey-headed who speak of the kindness and countenance they received from him in the days of their youth.

More need not be said of Dr. Latham, except that he was singularly temperate, when temperance was hardly yet thought a virtue; he was most pure in life and conversation, when to have been otherwise would have provoked no censure; and he was religious, when religion had yet no recommendation or countenance from the world.

Amongst those who have also been removed from this scene, after completing their days of usefulness, are Dr. Henry Locock, of Northampton, who had attained the age of 80; Dr. Mitford, the father of the distinguished authoress of "Our Village," at the age of 81; Sir James Leighton, formerly physician to the Emperor of Russia; and Dr. Algernon Crampton, physician to the London Hospital, at the age af 76.

We have also to mourn some friends taken from us before their promise of usefulness was fulfilled: Dr. R. Sims, of Brompton, and Dr. Adam Hunter, physician to the Leeds Infirmary.

Amongst our continental neighbours death has also not been inactive; we can only hastily mention the well-known names of Double, the editor of the *Journal Generale de Medicine;* of Bulard, who had devoted the greater portion of, comparatively speaking, a short life to the investigation of the nature and treatment of the plague; of Vigne, the author of the *Treatise on Apparent Death;* of Joseph Frank, son of the illustrious John Peter Frank, and author of perhaps the best treatise hitherto published on the "Practice of Physic;" and of the theorist Hannemahn.

ARTICLE II.

RETROSPECTIVE ADDRESS IN SURGERY,

DELIVERED AT THE

ELEVENTH ANNIVERSARY MEETING

OF THE

PROVINCIAL MEDICAL AND SURGICAL ASSOCIATION,

HELD AT LEEDS, AUGUST 2nd and 3rd, 1843.

BY WILLIAM HEY, JUN., ESQ.,

Surgeon to the Infirmary, Leeds.

When the Association did me the honour last year, at Exeter, to request me to read the Retrospective Address in Surgery on the present occasion, I undertook the task not without considerable apprehension that I should be unable to command sufficient time to enable me to discharge it in a manner satisfactory either to myself or the Association. I regret very much that the time I have actually been able to devote to it has been, owing to unforeseen inter-

ruptions, much less even than I anticipated; I have, therefore, been obliged to put this address together very hastily, and within a short period. As far, however, as circumstances would allow, I have endeavoured to fulfil the proposed object of these addresses, by bringing together the information diffused through our journals during the past year upon those subjects which appeared most worthy of notice. Beyond that period I do not profess to extend my retrospect, although I have not in every instance strictly confined myself within that limit; nor do I profess to have mentioned everything that is worthy of being mentioned. So numerous, indeed, are the communications upon every branch of surgical science with which our journals teem, that it would be impossible within the prescribed limits of an address of this kind to notice them all; and many of those which I have not altogether passed over, I have been compelled barely to mention, having dwelt, perhaps, too long on some of the more important and interesting subjects. I have only further to observe, that I have endeavoured to make this address as practical as possible, as I have had reason to believe that I should by that means make it the more acceptable.

I proceed, without further preface, to the execution of my task. I shall first devote a short space to anatomy and physiology, so far as it falls within my department, and then address myself to the more practical parts; and in order to preserve something like order, I shall class the subjects under the heads of the various tissues and regions of the body.

ANATOMY AND PHYSIOLOGY.

From the field of descriptive anatomy there is no longer any harvest to be reaped; the utmost that can be hoped from the most scrutinizing search is the gleaning of a few scattered ears which may have escaped the notice of those who have gone over the ground before. Amongst the most diligent and persevering cultivators of this field are our German neighbours, at all times distinguished for patient labour and minute research.

A new edition of the works of Soemmering is now in course of publication, under the superintendence of some of the most eminent anatomists and physiologists of that country. In the third volume of this work, edited by Professor Theile, of Bern, will be found an account of some new points in the anatomy of muscles. Some inaccuracies in the descriptions formerly given of several of the muscles about the face and throat are corrected, and some others are mentioned which had not previously been described, *e. g.*, the *rotatores dorsi*, which name is given to eleven small muscles on each side, which arise from the point or upper edge of each transverse process, and pass to the lower edge of the arch of the vertebræ above, as far as the basis of the transverse process. The first lies between the first and second dorsal vertebræ; the eleventh between the eleventh and twelfth dorsal vertebræ; the lower, with the exception of the last, are generally stronger than the superior; they are covered in their entire course by the *multifidus spinæ*, from which they are separated by a layer of

cellular tissue. The action of these muscles is to rotate the individual vertebræ on each other. There is a description also given of the extensor and flexor muscles of the coccyx, which are very small and seem to be merely the rudimentary form of the large muscles moving the tail of animals.* One cannot help regretting that Lord Monboddo did not live to enjoy this confirmation of his favourite hypothesis, that man was originally possessed of that appendage.

M. Jobert has read a paper at the Academy of Sciences in Paris, on the structure of the uterus, in which he endeavours to show that it is formed by a single muscle, the fibres of which take various directions.†

In our own country several very valuable works on descriptive anatomy have been published during the last few years; but I am not aware that within the period that falls under my notice any material additions have been made to our knowledge of this branch of the science. I ought not, however, to omit the mention of some valuable contributions to anatomy and physiology by Dr. Knox, contained in some recent numbers of the *Medical Gazette*. In the last retrospective address Mr. Dodd referred to the observations of Arnold, of Zurich, on the membranous coverings of the brain and spinal chord, which had been published by Dr. Knox, in an English form, accompanied by some important additions of his own. The first of the papers to which I now allude is upon the same subject; and

* *British and Foreign Medical Review*, October, 1842.

† *Provincial Medical Journal*, March 11, 1842.

the object of it is to maintain the accuracy of his description against that given, on the authority of Dr. Sharpey, by Mr. Viner Ellis, in his work on descriptive anatomy.*

Attention to the functions of organs both in health and disease has often led to discoveries in their anatomy, which dissection alone had been unable to trace. Of this we have had examples in the additions which have been made in late years to our knowledge of the anatomy of the nerves; and to these may be added the discovery of the connexion between the movements of the velum palati and the facial nerve by M. Diday. He considers this to be proved by a case of facial hemiplegia of the left side, in which the uvula deviated considerably to the right, but in which the deviation gradually disappeared with the other hemiplegic symptoms.†

Mr. Paget has published‡ some tables containing the results of measurements made with the view of determining the relative sizes of the trunks and branches of arteries. There was great discrepancy in the results obtained by all preceding observers, but the method adopted by Mr. Paget seems well calculated to obviate every source of fallacy, and he is, I think, justified in assuming that the difference between the results of his measurements and those of others must be referred to errors of the latter. Until the publication of a paper by Mr. Ferneley,§ which tended to an opposite conclusion, it was the generally received opinion that the aggregate area of

* *Medical Gazette*, June 23, 1843.

† *Provincial Medical Journal*, November, 12, 1842.

‡ *Medical Gazette*, July 8, 1842.

§ *Ibid*, December 7th, 1839.

the branches exceeded that of the trunks of arteries. The results obtained by Mr. Paget establish the truth of this rule in the majority of cases, although the enlargement is less than had been supposed; but there is a constant exception to it where the aorta divides into the common iliac arteries, for there, or at the division next lower down, the stream is always contracted. There can be no doubt, as Mr. Paget remarks, that these relations of size in the several parts of the arterial canal serve some particular end, with which at present we are not fully acquainted, but which afford an interesting and fruitful source of investigation to those who have leisure to bestow upon it. I would venture to suggest the question, whether the check opposed to the current of blood by the contraction in the diameter of the aorta at its point of bifurcation, taken in conjunction with the want of support to its walls in its passage through the thorax and abdomen, may not be one cause of aneurism of that vessel, the very great frequency of which I shall have occasion to notice in another part of this paper.

If there is not much to be gained from the cultivation of descriptive anatomy the case is very different with regard to minute or physiological anatomy. The introduction of new modes of investigation, especially the microscope, has here opened a wide field, from which an abundant harvest may be reaped, and a host of labourers is engaged in its cultivation. So many are they who have distinguished themselves in this field of inquiry, that it would be tedious to enumerate them,

and I am unwilling to make any invidious selection from their names; but I may be allowed to say, that our own countrymen are not a whit behind their continental neighbours in the talent and industry which their labours have displayed, and the success with which they have been crowned.

To give even a summary of the results that have been obtained by the use of the microscope would occupy far more time and space than can be devoted to it in this address; but I refer you to the report of Mr. Paget, published little more than a year ago, which contains a complete account of them down to that period.* I refer you also to Mr. Grainger's introductory lecture, delivered at St. Thomas's Hospital, in October last,† and to a good account of the "mode of formation, properties, and analogies of organic tissues," by Mr. Coventry.‡ I shall, consequently, have to detain you but a short time on this part of my subject, especially as my associate, Dr. Shapter, has undertaken, in conformity with the precedent of former occasions, to say what is necessary to be said on the minute anatomy and physiology of the fluids, the nervous system, and serous and mucous membranes. A few circumstances will, however, require notice.

In Mr. Paget's report, the fact of the single origin of all the tissues from primary cells is assumed to be established; but some observations of Mr. Gulliver§ render it probable that cells are not essential to the

* *British and Foreign Medical Review*, July, 1842.

† *Medical Gazette*, November 5, 1842.

‡ *Ibid*, August 13 and 26, 1842.

§ *London and Edinburgh Philosophical Magazine*, October, 1842.

formation of all textures, for it appears that fibrils, which may be the primordial fibres of certain parts, are formed by the simple act of coagulation in fibrine; and this happens not only when it has coagulated in contact with living textures, but when it has coagulated out of the body, simply from rest.

The structure of muscle is still a subject of debate, but the general opinion seems to incline to Dr. M. Barry's view, that the ultimate fibril consists of a double spiral. Dr. W. B. Carpenter and Mr. Dalrymple, who have seen his preparations, are convinced that he has fully demonstrated this. In the *Lancet* he has given a drawing of one of his preparations, which exhibits the double spiral, and also the transition state between the muscular fibril and fasciculus.*

M. Flourens, in a paper on the development of bone, read before the Paris Academy of Sciences, has proved that the internal as well as the external periosteum contributes to its formation. When both are entire and in a normal state, the action of each keeps within its own limits; "but if the internal periosteum be destroyed, the power of the external periosteum, being alone in its action, is augmented, and produces an entirely new bone outside the old one; and if, on the contrary, the external periosteum be destroyed, then the power of the internal periosteum being increased, an entire new bone is produced in the interior of the bone." His experiments also show that bones increase by successive layers interposed upon each other.†

* *Lancet*, October 29, 1842.

† *Medical Gazette*, December 16, 1842.

The question of the vascularity or non-vascularity of cartilages has been the subject of debate since the reading of the last address on surgery. Many eminent pathologists, amongst whom are Sir B. Brodie and Mr. Mayo, contend for their vascularity, and Mr. Liston has succeeded in demonstrating, by injection, the existence of vessels in the articular cartilage of several diseased joints; on the other hand, Cruveilhier, Velpeau, and Key, espouse the doctrine of their non-vascularity, and Mr. Toynbee has made a series of very minute observations, which tend to confirm the truth of this doctrine: his injections prove that the vessels which previous anatomists had traced up to the articular cartilages, and which they supposed to be continued into them, either as serous vessels or as red-blood vessels too minute for injection, actually terminate in veins without the limits of these tissues. Mr. Paget's report does not touch upon this subject. There is, however, no absolute inconsistency between the observations of Mr. Liston and Mr. Toynbee; for it must be recollected that those of the one were made on cartilage in its healthy, and of the other in its diseased state. It is not necessary that vessels should enter into cartilage for the purpose of its nutrition, for it is now generally acknowledged that this process, in most animal tissues, consists in changes undergone by the nutrient *liquor sanguinis* which has exuded into them through the coats of the capillaries ramifying through them; and as, in some structures which are not very vascular, the spaces between the capillaries are large, there is of necessity a considerable extent of tissue, which is nourished without being in contact with

blood vessels, and the tissue the furthest removed from the vessel is nourished equally well with that which is in immediate contact with it.

Mr. Toynbee extends the doctrine of non-vascularity to the cartilage of the different classes of fibro-cartilage, to the cornea, the crystalline lens, the vitreous humor, and the epidermoid appendages *

M. Bourgery has given, in the *Gazette Medicale de Paris,* an account of his investigations of the minute anatomy of the spleen, which is too long to be introduced here.† It does not appear to throw any new light upon the functions of that organ. Those functions, however, have been the subject of a voluminous discussion during the past year, but no conclusions have been arrived at which appear to me of sufficient value to repay the loss of time that would be incurred by going over it on the present occasion. Whatever purposes the spleen may be intended to serve in the animal economy, we know that they are not essential to life, as instances are on record where the entire organ has been removed without a fatal result; and the excision of it has even been proposed during the past year, by Mr. Eagle, as a remedy in some professedly incurable diseases.‡

The circulation of the blood through the capillaries still affords scope for investigation, and the past year has been productive of some new views respecting it. In a memoir by M. Poiseuille, read before the Paris Academy of Sciences, the author

* *Philosophical Transactions,* Part ii., for 1841, and *Medico-Chirurgical Review,* April, 1842.

† *Provincial Medical Journal,* October 1, 1840.

‡ *Lancet,* October 8, 1842.

states that he has proved, by direct experiments, that, in passing through tubes of small diameter, the fluid moves in a canal, the walls of which are themselves formed by the moving fluid, so that the various phenomena are independent of the nature of the walls of the tube, and connected with the reciprocal action of the fluid molecules in movement. From this he infers that the flow should present the same phenomena in living and in inert tubes. This opinion was confirmed by the results of other experiments performed on the capillaries of a living part, and of a part deprived of life.

Mr. Snow has read a paper on this subject before the Westminster Medical Society,* the object of which was to prove the existence of another power besides the action of the heart engaged in promoting the circulation: he defined it as follows:—"That the mutual changes which take place at the capillary vessels between the blood and the tissues are attended with attractions and repulsions, which assist to impel the blood in a definite direction. According to this view, nutrition, secretion, and indeed every function, would assist the capillary circulation of the part in which it took place."

Dr. Todd† affirms that hæmorrhage always takes place by rupture of the blood vessels, and not by exudation from their coats. This latter opinion has been sanctioned by high authority, because in some cases no solution of continuity or ruptured vessel can be found, even after the most careful examination of the hæmorrhagic surface; but he maintains

* *Medical Gazette,* March 3, 1843.

† *Dublin Journal of Medical Science,* September, 1842.

that if the red particles of the blood could escape without rupture of the vessels, there must be pores in their parietes, which could readily be distinguished by the microscope, which is not the case.

The subject of inflammation, which is so intimately connected with the actions of the capillary vessels, will be brought under your notice by Dr. Shapter.

TUMORS.

The method of treating tumors by compression has been revived. Somewhere about thirty years ago a hospital was established in London for the cure of cancer in the breast, by means of compression, under the auspices of Dr. Young; and for some time sanguine hopes were entertained of the success attending this mode of treatment, as the tumors in many of the cases were much reduced in size, or even disappeared. The disease, however, invariably returned; for the fact is, the diseased structure itself was not absorbed, but the healthy structures, even the bone, subjacent to it; the treatment, moreover, greatly aggravated the sufferings of the patient, the pressure being applied by means of pieces of sheet-lead firmly bound down upon the part by strips of adhesive plaster and a bandage. It is now proposed to apply it by means of an air cushion, half inflated; this is perfectly smooth, adapts itself to all inequalities of surface, and exerts an equable and uniform pressure. It is not to be expected that this mode of applying pressure, any more than that of Dr. Young, will prove effectual for the cure of cancer; but we must be

thankful for any addition to our means of retarding the progress of so intractable a disease, and of mitigating the sufferings of the patient. These advantages have been derived from it in the practice of Mr. Key, who informs me that he has tried it in several cases with good effect, and in some with a considerable diminution in the size of the tumor. Dr. Locock also lately informed me that he has seen great advantage derived from compression, even in cases of ovarian tumor; and a case of ascites, cured by compression, is recorded in the *Provincial Medical Journal,* October 8th, 1842.

THE SKIN AND ITS APPENDAGES.

Much attention has been devoted during the past year to the investigation of the pathology and treatment of diseases of the skin; and amongst those who have made valuable contributions to our knowledge of this subject, the names of Dr. Burgess, Mr. B. Phillips, Mr. Erichsen, and Mr. Erasmus Wilson, are particularly deserving of being mentioned. The last-named gentleman has propounded a new classification of them, which, as being founded on the anatomy and physiology of the skin, he designates the natural system of classification. It seems to possess some advantages over that of Willan, which has hitherto been generally received amongst us, and to be well calculated to facilitate and simplify the study of cutaneous diseases. Any lengthened examination of the comparative merits of the two systems would here be out of place; but I recommend to your notice Mr. Wilson's treatise, which will well repay the time bestowed on its perusal.

The diseases of the skin, however, are often so intractable, and the treatment of them redounds so little to the honour of the medical practitioner, that we are ready to catch at any new remedy which promises to be successful; I shall, therefore, without any reference to classification, briefly mention those of which I find favourable notice during the year. For the cure of *tinea favosa,* the parasitic origin of which seems to be pretty clearly established,* Dr. William Davidson recommends the ioduret of sulphur, in the proportion of from 20 to 40 grains to an ounce of axunge.† Its use should be preceded by poultices to remove the crusts, after which the hair should be cut close or shaved. The same disease has been successfully treated in Vienna with a saturated tincture of iodine, and by the use of caustic applications;‡ and in the number of the *Provincial Medical Journal,* of May 27th, a description is given of the mode of treatment which has been so successfully employed in Paris by the Fréres Mahon. The first stage of the treatment consists in thoroughly cleansing the scalp, which is effected by poulticing, by frequent ablutions with soap and water, and by the use of an ointment and lotion. When this is accomplished, the second stage of the treatment commences, the object of which is to remove the hair, *slowly* and *without pain,* from all the points of the scalp occupied by the favus. This is effected by the use of a depilatory ointment and powder; the ointment is applied every second day,

* *Archives Generales de Medecine,* and *Lancet,* November 19, 1842.

† *Edinburgh Monthly Journal,* and *Provincial Medical Journal* January 14, 1843.

‡ *Provincial Medical Journal,* February 4, 1843.

and the powder, which is a more powerful agent, once a week: on the intervening days the hair is combed with a fine comb to remove the loose hairs. The formulæ of the applications are not certainly known, but they have been analyzed, and are supposed to be as follows:—

THE DEPILATORY OINTMENT.

Slaked lime	8 scruples.
Soda of commerce	12 ditto.
Lard	64 ditto.

THE DEPILATORY POWDER.

Wood-ashes	64 parts.
Pulverized charcoal	32 ditto.

THE LOTION.

Lime water	500 parts.
Sulphate of soda	185 ditto.
Alcohol	24 ditto.
White soap	10 ditto.

In a very aggravated case of dartrous eruption affecting the scrotum and perineum, which had resisted almost every variety of treatment for upwards of two years, Dr. Barosch, of Lemberg, succeeded in effecting a cure by the use of a lotion composed of fifteen grains of iodine and two scruples of hydriodate of potass, dissolved in five ounces of water with one ounce of spirits of wine.*

M. Emery has introduced naphthaline as a remedy for lepra and psoriasis, in the proportion of one to two drams in one ounce of lard.† This application often produces great irritation, which,

* *Provincial Medical Journal*, April 29, 1843.

† *Ibid*, May 13, 1843.

however, is easily removed by emollient fomentations or poultices.

Dr. Cless, of Stuttgard, not only confirms M. Emery's experience of the utility of naphthaline in lepra and psoriasis, but recommends it in all kinds of chronic cutaneous diseases.*

In the incipient or tubercular stage of lupus an ointment containing the proto-ioduret or the deuto-ioduret of mercury is recommended; it must be gently rubbed over the tubercles occasionally. When ulceration is established, caustic applications of various kinds are used; but that which seems to have been used with the greatest success during the past year is the chlorate of zinc. Some cases are recorded by Dr. Byron, of the County of Meath Infirmary, in which a cure was effected by means of it. In the constitutional treatment of this affection Mr. Donovan's liquor hydriodatis arsenici et hydrargyri has been found beneficial.†

Vaccinia being classed amongst the diseases of the skin, I shall here introduce what I have to say on the subject of vaccination. The question of the identity of small-pox and cow-pox may be considered to have been set at rest by the experiments of Mr. Ceely and others; but still the nature of the disease seems open to further investigation. M. Serres has made some observations on which he grounds the hypothesis of the insect origin of small-pox.‡ His experiments, however, are not conclusive on this point, but they seem to favour the

* *Schmidt's Jahrbücher*, and *Medical Gazette*, November 11, 1842.

† *Provincial Medical Journal*, February 11, 1843, and *Dublin Journal of Medical Science*, September, 1842.

‡ *Medical Gazette*, December 9, 1842.

opinion that in the treatment of the disease it is beneficial to exclude light. This may possibly account for the beneficial effects of the application of mercurial ointment, which has been recommended by Dr. Stewardson, in America, and others.

A paper has been published by Lichtenstein, in *Hüfeland's Journal,* which is worthy of notice.* He has inoculated with clear lymph taken from pustules produced by friction with tartar-emetic ointment, and found that it produced pustules which could not be distinguished from those produced by vaccine matter. The lymph of the tartar-emetic pustules was inoculated from individual to individual, and invariably produced pustules of the same kind. But what is the most remarkable is, that this matter seemed to be possessed of the same anti-variolous properties as the true vaccine matter; for a considerable number of individuals so inoculated were placed in intimate relation with individuals affected with small-pox, during an epidemic of that disease, and they all escaped contagion.

But whatever new light may be thrown by future investigators upon the nature of the disease, the question which concerns us most is that of the protective power of cow-pox against small-pox. That is a question which must be decided by experience, and I am happy to be able to report that all the evidence I could collect is in favour of the affirmative.

The first and most important document to which I have to refer, is the report of the Vaccination Commission of France for the year 1840, the most

* *Provincial Medical Journal,* November 5, 1842.

recent to which I have had access, and which has not hitherto, I believe, been specially brought under the notice of this Association. It appears from this report, that 525,509 vaccinations were performed. The epidemic variola affected 14,470 persons; of these 1,668 died, and 1,390 remained more or less disfigured and enfeebled. There were 24 instances of second attacks of variola; in three of these the disease proved fatal; an immense majority of the vaccinated persons escaped entirely the influence of variola. Some were affected with a varioloid disease, or a sort of modified variola, which was usually very mild, and occasionally resembled the vaccine. Of 406 vaccinated persons, who were affected in different degrees of severity, six only died. Of 2,214 re-vaccinations, there were 1,704 cases in which it failed, 227 in which a pseudo-pock was formed, and 270 in which perfectly normal vesicles appeared; three re-vaccinated persons only were subsequently affected with a varioloid affection.

M. Milon, in a memoir on vaccination, states that in an epidemic of small-pox, which he had occasion to observe, the disease was invariably arrested by vaccination; and that, although a few vaccinated persons were attacked by it, the disease in them showed itself in the form of a varioloid. The persons so attacked, moreover, had been vaccinated a long time previously.*

M. Serres, who has seen between 1,700 and 1,800 cases of small-pox, is certain that the number of those affected with small-pox after vaccination was

* *Provincial Medical Journal*, September 17, 1842.

not greater than that of those who had small-pox twice.*

There are several cases recorded in the *Lancet* in which small-pox and cow-pox existed simultaneously,† but which illustrate, in a very striking manner, the power of cow-pox to arrest or modify the symptoms of small-pox. These were cases in which the patients were vaccinated after having taken the infection of small-pox, which was thereby rendered so mild as to produce scarcely any constitutional disturbance, and only a few scattered pustules.

A letter from Mr. Knight, the Superintendant-Registrar of Birmingham, published in the *Provincial Medical Journal* of March 11th, bears strong testimony to the efficacy of vaccination, as well as to the beneficial results of the late "Act to extend the Practice of Vaccination."

The opinion of the necessity of re-vaccination seems to gain ground. It has been already mentioned that in the epidemic observed by M. Milon all the persons attacked by small-pox after vaccination had been vaccinated a long time previously. The same fact has been observed in Italy, where during the last few years there have been several epidemics of small-pox. From the facts thus observed, M. Thomasini, and other Italian physicians, conclude that the preservative influence of vaccination lasts about ten or twelve years, and therefore advise that re-vaccination should be had recourse

* *Medical Gazette*, December 9, 1842.

† *Lancet*, January 28, February 11, and February 18, 1843.

to after that period.* In this country also an opinion, founded upon the observation of similar facts, has been advanced, that vaccination should be renewed every seven years.†

It appears that vaccine matter will retain its infecting properties for an almost unlimited time, if kept carefully excluded from the air, Dr. Graham Weir having vaccinated successfully with matter that had been kept for twenty years, and during that period had been four times carried to India and back again; some had been preserved in the dry state between plates of glass, the remainder was liquid and had been kept in small glass tubes hermetically sealed.‡

I will only mention further, in relation to this subject, that there are two cases recorded during the year in which infants in utero were attacked with small-pox; in one of the cases the disease assumed the confluent form, and the child died on the 9th day after birth;§ the other recovered.‖

On the subject of burns and scalds I will only detain you by the mention of two remedies which have been recommended during the year. The first is the nitrate of silver. Mr. Henry Jackson, of Sheffield, has found that when applied in cases of superficial burns in children, in the form of solution, (ten grains to the ounce) the pain has very shortly

* *Provincial Medical Journal*, April 29, 1843.

† *Lancet*, February 11, 1843.

‡ *Provincial Medical Journal*, August 27, 1842.

§ *Bulletin delle Scienze Medicale di Bologna*, and *Medical Gazette*, August 19, 1842.

‖ *Bulletin de l'Academie Royale*, and *Lancet*, February 18, 1843.

ceased, and vesication has been prevented.* We have long been in the habit of using this remedy in the Leeds Infirmary in similar cases. The other remedy to which I have referred is a solution of gum-arabic, which is recommended by Mr. Rhind, of Edinburgh.† It seems to act on the same principle as many other applications which have been long in use, viz., by defending the part from the influence of the air.

Mr. Erichsen has communicated, through the *Medical Gazette*,‡ some valuable observations on the pathology of burns, and has exhibited in a tabular form the relative frequency with which different organs are affected at different ages. The practical conclusions at which he arrives are, that the first object in the constitutional treatment of these injuries should be to relieve the system of an abnormal quantity of fluid that must have accumulated in it, in consequence of the arrest, to a greater or less extent, of so important a secretion as the perspiration; and that any appearance, however slight, of the supervention of inflammation in the organs contained within the head, chest, or abdomen, should be watched with the utmost anxiety, and treated as actively as the circumstances of the case will admit. Mr. Curling has also called the attention of the profession to the frequency of acute ulceration of the duodenum as a consequence of burns.§

A very important improvement has been made

* *Provincial Medical Journal*, December 31, 1842.

† *Dublin Journal of Medical Science*, January, 1843.

‡ *Medical Gazette*, January 13, 1843.

§ *Dublin Journal of Medical Science*, March, 1843.

by Dr. Mutter, of Philadelphia, in the treatment of deformities resulting from burns, especially those situated on the anterior part of the neck and chest.* When these accidents occur during childhood, the best directed treatment may fail to prevent the cicatrix from contracting, so as to draw down the chin towards the breast; and as the patient grows the deformity increases, for as the cicatrix does not yield in proportion to the development of the other parts, the chin becomes still more depressed and fixed in its unnatural position, so that the patient cannot close his mouth. The form of the bone also is altered: the teeth project in nearly a horizontal direction, the lower lip is drawn down and everted, and the saliva is continually flowing from the mouth, so that the patient's condition is most distressing to himself and disgusting to the beholder. The attempt to remedy this state of things by the division of the cicatrix seldom succeeds; indeed it never can *perfectly* succeed, because the cicatrix must contract again in the healing, in obedience to the laws of nature, which regulate the process of reparation.

[I stated, at the time of reading this passage, that I believed our late respected president, Mr. James, of Exeter, had been more successful than any other surgeon in his treatment of these cases, and alluded to a case which I, along with other members of the Association, had seen in the hospital at Exeter last year. Mr. James subsequently favoured the meeting with a paper on

* *American Journal of Medical Science*, July, 1842, and *Provincial Medical Journal*, December, 3, 1842.

the subject, in which he gave an account of his mode of operating, and exhibited the apparatus worn by the patient during the cure, in order to prevent the cicatrix from contracting. This paper was illustrated by a reference to several cases which he stated to have been successfully treated, and particularly to the one to which I have already alluded. But I must be allowed to say—and I say it with the greatest respect and deference to Mr. James—that I think the case is not perfectly satisfactory; for it appears that the wound was not healed when the patient left the hospital; and at the date of the last report, which was not less than a year after the operation, it still remained open. This was attributed by the surgeon under whose care she then was "to her having neglected the application she ought to have employed." Was it not rather owing to the means which were used to prevent contraction? There can be no doubt, I think, that if allowed to contract, the wound would quickly heal; but then the object of the operation would be defeated, and that is precisely the difficulty that we have to contend with in the treatment of these cases; in counteracting the tendency to contraction, we counteract the natural process of healing. I readily admit that these cases are not so hopeless as they have generally been represented, that much may be effected by the judicious and persevering use of appropriate means, and that the means employed by Mr. James are, perhaps, the most appropriate that can be devised; but still the law of nature remains—

"Naturam expellas furcâ, tamen usque recurrit."]

Dr. Mutter has evaded the obstacles opposed by this cause to the successful treatment of such cases, by applying to them the Taliacotian operation. In a very extreme case of deformity which he has described, after dividing the cicatrix and the attachments of the sterno-cleido mastoideus muscle, which was necessary to be done before the head could be restored to its proper position, he brought up a flap of integument from the shoulder to fill up the chasm occasioned by the gaping of the wound, and secured it by sutures; the flap united by adhesion, and the object of the operation was attained.

The same principle has been applied with success to cases in which operations have been performed for the removal of diseases implicating the eye-lid, the flap being taken from the temple.*

For the cure of that troublesome complaint, onyxis, which is generally treated by excision of a portion of the nail, M. Payan, surgeon of the Hotel Dieu, Aix, recommends the application of the Vienna paste, (a caustic composed of six parts quick lime and five parts pure potass,) to that portion of the matrix of the nail which corresponds with the part involved in the vicious growth.† M. Gerdy, on the other hand, recommends the removal of the lateral and inferior parts of the toe itself, which rise to suffer pressure from the edge of the nail, and to ulcerate under it.‡

In onychia maligna Dr. Colles has succeeded in effecting a cure by mercurial fumigation. It is

* *Annales de Chirurgie*, Jan., 1843, and *Provincial Medical Journal*, April 29, 1843.

† *Provincial Medical Journal*, October 22, 1842.

‡ *Ibid*, May 20, 1843.

applied by means of a candle composed of one drachm of the hydrargyri sulphuretum rubrum to two ounces of wax. Constitutional treatment is generally required.*

MUSCLES AND TENDONS.

The rage for dividing muscles and tendons which prevailed a few years ago is somewhat moderated, and it is not now believed that every deformity incident to the human frame can be removed by this means. The wholesale division of the muscles of the back, from which we were led to expect such happy results in the treatment of curvature of the spine, has been abandoned, and a sounder pathology has taught us that neither in these cases, nor in contractions of the joints, can the section of the muscles or tendons correct a deformity which depends on a morbid condition of the bones. With respect to the spine, Professor Syme has stated that the only cases of curvature to which the operation of myotomy is applicable are those which accompany wry-neck, and are produced by a permanent contraction of the sterno-cleido mastoideus muscle.† Of its successful application to cases of this kind he has given some examples, and I can bear testimony to its efficacy from my own experience.

The operation has been performed with success in some cases where the affection of the muscles was of a more decidedly spasmodic character, of which there is an instance in a remarkable case

* *Provincial Medical Journal,* May 20, 1843.

† *London and Edinburgh Journal of Medical Science,* April, 1843.

reported by Mr. Cocks, of Dundee.* In this case the dorsal muscles were contracted to such a degree as to produce an anterior curvature of the lower half of the spine, and constituted a tense band along each side of it. The section of these bands gave instant relief, and was followed by a permanent cure. The disease called scrivener's spasm has also been cured by the division of the flexor longus pollicis.†

The division of the muscles of the eyeball, which may be considered an established remedy for strabismus, has been applied to the treatment of myopia, kopyopia, (the disposition to fatigue of vision,) and amaurosis.‡ But before we attempt the cure of these affections by an operation, we ought to decide, in the first place, whether the disease depends on an abnormal condition of the muscles or on some defect in the organ of vision; and, in the next place, we ought to ascertain which, if any, of the muscles are in fault; for it appears that in myopia one surgeon divides the obliquus superior, another the obliquus inferior, a third, two of the recti, and a fourth, all four of them.

THE BONES.

Nothing tends so much to the discredit of a remedy as the indiscriminate zeal of its advocates, and it is to be feared that the operation of myotomy may suffer from this cause. This is a consequence much to be deprecated, for it is a remedy of the greatest value, and we can scarcely, as yet, foresee

* *Medical Gazette*, March 10, 1843.

† *Medico-Chirurgical Review*, July, 1842.

‡ *Ibid.*

the limits of its extension. Its successful application to the reduction of very old dislocations was noticed in the last retrospective address; and I have now to mention that it has been found equally advantageous to the treatment of fractures. In a case of compound fracture of the leg, with considerable projection of the bones, which could not be reduced on account of the contraction of the muscles of the calf of the leg, M. Jobert divided the tendo-achillis, which removed the difficulty.* I have myself, in a recent case of compound dislocation of the ankle, derived great advantage from a somewhat similar proceeding. The dislocation was easily reduced, but there was a strong tendency to displacement of the foot backwards; I therefore divided the tendons of the tibialis posticus and flexor longus digitorum, which were exposed by the wound, after which there was no difficulty in retaining the limb in a proper position.

The division of the tendons of those muscles which impede the reduction of fractures, or tend powerfully to displace the extremities of the bone after reduction, is the only material improvement in the treatment of those injuries of which I find any record during the past year. It may however be worth while to notice a method of applying the starched bandage, which is calculated to obviate one of the principal objections to its use, viz., its allowing no room for the swelling of the limb, and thus endangering its safety by inducing gangrene. The plan is, as soon as it has become dry, to slit it down along the whole of its length, in the space

* *Bulletin de Thérapeutique, & Provincial Medical Journal*, Aug. 6, 1842.

between the tibia and fibula. This will allow of some degree of expansion of the limb, and if the sides of the opening are held aside its condition can be examined.*

It ought also be mentioned that in the treatment of compound fractures the use of bran dressing is strongly recommended by Dr. Reynell Coates and Dr. Rhea Barton.† Its advantages are that it gives efficient support to the limb, without exciting any injurious pressure upon it. They have also found it very useful in arresting the hæmorrhage which often accompanies these accidents.

Some cases of ununited fracture have been successfully treated by methods with which we were previously acquainted. In one case Mr. Worthington, of Lowestoft, after producing the necessary degree of inflammation by friction of the ends of the bone against each other, applied the starched bandage.‡

M. Blandin has noticed the not unfrequent occurrence in young subjects, of fracture of the clavicle without displacement, and has pointed out the diagnostic symptoms.§ These are a circumscribed tumor in the middle portion of the bone, consecutive on a fall on the shoulder, and motion of the parts, with crepitus. It is of importance that the nature of these injuries should be understood, as consecutive displacement usually takes place, if not prevented by appropriate treatment.

* *Dublin Journal of Medical Science*, November, 1842.

† *American Journal of Medical Science*, No. vi., and *Provincial Medical Journal*, September 24, 1842.

‡ *Provincial Medical Journal*, October 29, 1842.

§ *Journal de Med. and Chir. Prat.*, July, 1842, and *Provincial Medical Journal*, November 12, 1842.

For the diagnosis of fractures in general, M. Lisfranc has called in the aid of the stethoscope.* This promises to be a valuable addition to our means of detecting those fractures in the neighbourhood of joints which are rendered so obscure by the great swelling and tension of the parts almost immediately following the injury, and which are not unfrequently either overlooked or mistaken for dislocations.

In the treatment of diseases of the bones I do not meet with anything of sufficient importance to detain us, except the notice of some operations which have been performed for the removal of the diseased superior and inferior maxillary bones. Excision of the jaw is not a new operation, but it is one of so much importance, that until the practice of it becomes more general, every successful example of it deserves to be recorded. I find but four cases of recent occurrence reported, one of which was performed in Paris by M. Hugier,† and the other three in this town—two by Mr. Teale,‡ and one by myself.§ There is another case reported by Dr. Byron, of the Meath Infirmary, but that operation was performed twelve months ago.‖ Mr. B. Phillips

* *Medico-Chirurgical Review*, January, 1843.

† *Provincial Medical Journal*, December 21, 1842.

‡ *Ibid*, March 26, 1842, and March 4, 1843.

§ *Ibid*, July 15, 1843. Since the meeting of the Association at Leeds the upper jaw has been removed in two more cases, by Mr. Smith. One of the patients was in the Infirmary at the time of the meeting, and was seen and carefully examined by many of the members of the Association. In this case it was found necessary to remove the malar bone as well as the superior maxillary, by which means the diseased growth was completely extirpated. Both the patients recovered very well.

‖ *Dublin Medical Journal*, July, 1842.

has recorded a case in which he partially removed the lower jaw.* The result of all these operations has been highly satisfactory, the patients having been relieved from a disease otherwise incurable, and which, before the introduction of this operation, invariably progressed to a fatal termination. The case reported by Dr. Byron is peculiarly important, as illustrating the permanency of the cure. In order to insure success, however, it is necessary that the operation should be performed before the disease has extended to the soft parts.†

Professor Mott, in America, has performed an operation somewhat similar, for the removal of a large fibrous tumor in the nose.‡ In this case the whole of the superior maxillary bone was not removed, but only so much of it, along with the os nasi, as enabled him to detach the entire os spongiosum inferius, from which he conceived the morbid growth to arise. An important case is also reported by Mr. Syme, in the *London and Edinburgh Monthly Journal,* in which he removed a malignant tumor from the nose.§ The case had at first been considered incurable; but Mr. Syme having divided the lip and turned back the flaps, so as to expose the root of the tumor, it was ascertained that it grew from the septum, and that its origin was of limited

* *Medical Gazette,* July 22, 1842.

† Besides the cases above mentioned I find the reports of two others which I had overlooked. In one of these cases the superior maxillary bone was removed by Mr. James Douglas, and in the other by Mr. W. Lyon, both of Glasgow. The result of both these cases was unfortunate, the disease being of a malignant nature.

‡ *Ibid,* March 24, 1843.

§ *London and Edinburgh Monthly Journal,* September, 1842, and *Medico-Chirurgical Review,* October, 1842.

extent. That part of the septum from which it grew was removed, and in the course of a few days there was hardly any perceptible trace of the operation, and the patient has since continued perfectly well. This case illustrates the advantage of dividing the lip, instead of slitting up the ala nasi, in order to give free access to the nostril. It both affords more space and occasions less deformity; we may also learn from it, that such cases ought not to be hastily abandoned as hopeless.

THE JOINTS.

An important contribution has been made by Mr. Syme to the diagnosis of dislocation of the thigh bone into the ischiatic notch, that which, according to Sir A. Cooper, is the most difficult of detection. The pathognomonic symptom to which he refers, and which, he says, is never absent, always well marked, and not met with in any other injury of the hip joint, whether dislocation, fracture, or bruise, is an "arched form of the lumbar part of the spine, which cannot be straightened so long as the thigh is straight or in a line with the patient's trunk. When the limb is raised or bent upwards upon the pelvis, the back rests flat upon the bed; but so soon as the limb is allowed to descend, the back becomes arched as before." He says, that by attention to this symptom he has been enabled to recognise the existence of dislocation into the ischiatic notch, when it had been unnoticed by others, and on one occasion, when it was supposed that the replacement had been effected through powerful extension by the pulleys.*

* *Provincial Medical Journal*, June 24, 1843.

M. Roux has pointed out the necessity of attending to the modification of the symptoms of dislocation of the fore-arm backwards, effected by age, sex, and constitution, which he thinks have not been sufficiently attended to by authors.* In illustration, he gives the case of a boy, aged 13, of weakly constitution, in which this dislocation occurred, and in which the forearm was in a state of complete extension. He thinks this may happen not only in women and children, but in any persons whose muscular system is but slightly developed. This injury may be diagnosed, independently of the state of the arm as regards flexion, by the union of the three following signs:—1st. Projection forwards of the lower end of the humerus; 2nd., projection of the olecranon above the transverse line of the tuberosities; 3rd., a depression above the olecranon.

M. Benoit has succeeded in reducing a dislocation of the head of the femur on the ilium, after the failure of other means, by a new method. It consisted in a combination of movements simultaneously effected by—1. pushing the thigh upon the pelvis, so as to force the flexion a little; 2. drawing the thigh upwards; and 3. carrying the leg in abduction, so as to give a movement of rotation forwards and inwards to the head of the femur. For a more particular account of it I refer you to the *Provincial Medical Journal,* of November 9th, 1842. The reduction was effected by this method in a few seconds, although a week had elapsed since the occurrence of the dislocation.

The same number of the *Provincial Medical*

* *Journal de Med. et Chir. Prat.*, September, 1842, and *Provincial Medical Journal,* November 12, 1842.

Journal, to which I have referred you for an account of M. Benoit's method of proceeding in the reduction of dislocation of the hip, contains also a description of a new method used by him with success in the reduction of a dislocated shoulder.

There are two cases of dislocation of the elbow reported in the number of the *Provincial Medical Journal,* of December 24th, 1842, in which reduction was effected at the expiration of fourteen weeks and five months, respectively. It has hitherto been thought useless to attempt the reduction of dislocations of the ginglymoid joints after the lapse of many weeks; but these cases show what may be done by a perseverance in well-directed efforts. The extension was kept up for an unprecedented length of time; in one case for six hours, and in the other for eight hours and a half, without any intermission. It may be a question, after all, whether the reduction would not have been effected in less time, with less pain to the patient, with less injury to the parts concerned, and less consequent inflammation, if recourse had been had to the sub-cutaneous division of the tendons and such other adhesions as opposed the principal obstacles to it. As I consider that all cases in which reduction has been effected after long continued dislocation are worthy of being recorded, I take the opportunity of mentioning, that during the present year I have succeeded in reducing a dislocation of the femur on the dorsum of the ilium, of nine weeks' standing. The recovery of the patient was perfect.

I have only further to notice, in connexion with the subject of dislocation, the report of a case by

Mr. May, of the Berkshire Hospital, which confirms the views of Dupuytren respecting congenital dislocations;* and a case of dislocation of the hip in a child, aged only three years, reported by Mr. Kirby.†

Passing on to the diseases of joints, we find that in hydarthrosis, and in scrofulous abscess of the knee joint, M. Bonnet, of Lyons, has used with success injections of iodine in solution.‡ In introducing the trocar care is to be taken to draw aside the skin, so that the outer and inner wounds may not correspond with each other afterwards: this is necessary to prevent the admission of air into the cavity of the joint. Only a small portion of the fluid contained in the joint is let off, and then an equal quantity of the solution of iodine is injected and allowed to remain. The effect of these injections in hydarthrosis is to produce a considerable degree of inflammation; but in the cases of scrofulous abscess which are recorded, the re-action seems to have been very slight. This may probably be owing to the cavity of the abscess being lined with a false membrane of some thickness. In all the cases reported the treatment seems to have been followed by a great improvement in the patient's condition, if not a perfect cure.

A less formidable mode of curing effusion into the joints is proposed by Mr. Moritz, of Coblentz, viz., the external application of the nitrate of silver.§ It may be applied either by drawing the substance across the moistened surface at intervals of about a

* *Medical Gazette*, October 8, 1842.

† *Dublin Medical Press*, Oct. 26, 1842, and *Lancet*, Nov. 12, 1842.

‡ *Bulletin de Therapeutique*, Dec. 30, 1842, and *Provincial Medical Journal*, February 4, 1843.

§ *Medicinische Zeitung*, No. xxvi., 1842, and *Lancet*, Dec. 3, 1842.

quarter of an inch, or by painting the surface with a solution of it, of such a strength as to produce slight vesication. After the desquamation of the cuticle which follows, the treatment is to be repeated until the joint is reduced to its natural size. This mode of treatment does not seem to differ in principle from the ordinary mode of producing counter-irritation by the application of blisters; but M. Moritz says, that in more than twenty cases he has obtained, in a very short time, a complete cure, although they had resisted all previous methods of treatment.

In the *Provincial Medical Journal,* December 10, 1842, Mr. Slater reports a case of effusion into the knee joint, which was treated successfully with large doses of tartar emetic, as recommended by M. Gimelle.

In the treatment of recent anchylosis, resulting from various affections of the joints, or from prolonged absolute quietude of a limb, M. Malgaigne recommends forcible flexion and extension to be had recourse to, even while some degree of pain continues, provided there are no symptoms of increased action remaining.* This proceeding is attended with considerable pain at the time, but its beneficial effects soon become evident. In a very recent number of the *Provincial Medical Journal,*† a case is quoted from an American journal, in which Dr. Buck performed excision of the olecranon for the cure of anchylosis of the elbow joint. The condition of the patient was improved by the joint

* *Provincial Medical Journal,* February 4, 1843.

† *Ibid,* July 15, 1843.

being brought into a better position, but it does not appear that much extent of motion was gained.

There is a chapter in M. Lisfranc's *Clinical Surgery* devoted to the subject of white swelling of the joints, which contains many valuable remarks, but I will not detain you by any lengthened notice of it, which is the less necessary, as the most important part of it is given in the *Medico-Chirurgical Review*, and in Mr. Braithwaite's *Retrospect* recently published.

Several cases of excision of the elbow joint are reported by M. Roux,* all of which, excepting one, were successful. He attributes the success he has met with in a considerable degree to an important modification adopted by him since August, 1840, viz., making a T incision by the side of the limb instead of the H. incision usually employed. Its principal advantage is that it renders it more easy to dress the wound without disturbing the limb, or causing it the slightest motion. Amongst the cases reported by him is one of excision of the wrist joint, to which that operation is not usually considered applicable, but in which, notwithstanding, it succeeded. I have performed this operation during the year on the elbow joint, in a case which I thought offered a good prospect of success, but the patient died from irritative fever.

THE VASCULAR SYSTEM.

Aneurism.—In looking over the journals of the past year I have been surprised at the number of cases of aneurism which are recorded. A large pro-

* *Medico-Chirurgical Review*, October, 1842.

portion of these consists of cases of aneurism of the thoracic or abdominal aorta. The diagnosis of these diseases in an early stage, although much facilitated by the use of the stethoscope, is extremely obscure; and any hints calculated to assist us in our investigation of them ought to be thankfully received. Dr. Law, of Dublin, thinks aneurism of the aorta may be with certainty distinguished by the peculiar character of the pain which usually accompanies it. The pain, he says, is presented in a two-fold character: the one being a constant, dull, aching pain; the other, an occasional, sharp, darting, and lancinating pain; he states, further, that he is not aware of any other morbid condition under which a similar character of pain occurs.*

The existence of this pain seems to depend on the aneurism being so situated as to be subjected to pressure, which resists its tendency to expansion, as in the thoracic, or at the posterior side of the abdominal aorta. The sharp lancinating pain he considers to be neuralgic; and the dull, aching, constant pain, either to be connected with the absorption of bone, or to be the characteristic modification of the sensibility of inflamed arterial tissue. In the *Provincial Medical Journal*, of January 7th, a case is related in which Dr. Law was enabled to arrive at a correct diagnosis, principally by attention to this symptom, although the case was so obscure that another practitioner who was consulted was of a different opinion.

If the diagnosis of internal aneurism is important in relation to the treatment, that of external aneu-

* *Dublin Medical Journal*, July, 1842.

rism is still more so. This remark is called forth by the history of a case which has occurred since our last meeting, and which has been the source of some controversy and difference of opinion. I allude to a case of carotid aneurism, opened by Mr. Liston on the supposition that it was a chronic abscess. Mr. Liston published a pamphlet upon it,* the object of which was to prove that the tumor was originally an abscess, which, by pressure on the coats of the artery, previously weakened by the destruction of its vasa vasorum, had occasioned their absorption, and thus a communication had been established between them. He adduces several cases in confirmation of his views; but without pronouncing any opinion upon the correctness of his hypothesis with reference to this particular instance, or *how* it came to be an aneurism, we cannot entertain a doubt that it *was an aneurism* at the time it was opened, and that a surgeon of Mr. Liston's great ability and experience could have had no great difficulty in ascertaining that by a careful examination. Unfortunately, the rarity of the disease at the patient's age led him to form too hasty a conclusion.

It is due to Mr. Liston to mention that, besides the cases he has brought forward in support of his views, there are some others of a similar nature put on record during the past year. In the *Provincial Medical Journal*, of April 2nd, 1842, there is a case reported by Mr. Storrs, of Doncaster, in which a man who had a large abscess in the neck died from venous hæmorrhage, in consequence of a large vein,

* *On a Variety of False Aneurism*, by Robert Liston, F.R.S.

supposed to be the internal jugular, being opened by an abscess. In the same journal, of April 29th, 1843, there are two cases recorded: in one of them the patient died from hæmorrhage, resulting from a communication between the pulmonary artery and an abscess in the lung; in the other, some enlarged glands lying between the gullet and the aorta suppurated, and produced, first, ulceration and perforation of the gullet, and finally, of the coats of the aorta. The patient died from effusion of blood into the gullet and stomach.

In the *London and Edinburgh Monthly Journal of Medical Sciences*, March, 1843, there is a case published by Mr. Alexander King, in which fatal hæmorrhage occurred in consequence of the internal jugular vein being opened by an abscess. In this instance the fact was verified by dissection.

Notwithstanding the number of cases of aneurism recorded during the year, there are but few reports of operations; but those few are of considerable interest and importance. The case which claims the first notice is one in which a ligature was applied to the aorta immediately above its bifurcation, by Dr. Monteiro, of Rio de Janeiro.* The patient survived fifteen days. The common iliac has been tied in the Pennsylvania Hospital, by Dr. Peace, for an inguinal aneurism, with success;† and the external iliac has been successfully tied by Mr. Bellingham, in St. Vincent's Hospital, Dublin, for an aneurism of that vessel.‡ This case is interesting, from the circumstance of the ligature having

* *Lancet*, November 26, 1842.

† *Dublin Journal of Medical Science*, March, 1843.

‡ *Ibid*, January, 1843.

been applied close to the bifurcation of the common iliac, and where, of course, no internal coagulum could be formed. The femoral artery has been tied in the Mary-le-bone Infirmary, by Mr. Phillips, in a case of popliteal aneurism; but this operation was followed by gangrene and the death of the patient.* The carotid has been tied in King's College Hospital, by Professor Fergusson, on Brasdor's principle, in a case of aneurism of the innominata. It was intended afterwards to tie the subclavian, but the patient died, twelve days after the operation, of an attack of bronchitis. The brachial artery has been tied by Dr. Adair Laurie, of Glasgow, in a case of that singular disease, cricoid aneurism.† The operation was followed by gangrene of some of the fingers; but the patient recovered, and the disease appeared to be cured. [Since the reading of this address I have tied the femoral artery, in a case of popliteal aneurism, with a successful result.]

Whilst upon the subject of the ligature of arteries I take the opportunity of mentioning some cases in which that operation has been performed on other accounts than that of aneurism. The brachial artery has been tied by Mr. Thornhill, of Darlaston, on account of hæmorrhage from a wound in the arm.‡ The operation of tying the carotid was attempted in the New York Hospital, on account of hæmorrhage occasioned by an ulcer having opened the inferior thyroid artery; but as the patient died from a recurrence of the hæmorrhage,

* *Medical Gazette*, December 9, 1842.

† *Medical Gazette*, October 21, 1842.

‡ *Medical Gazette*, March 24, 1843.

it was found in the *post-mortem* examination of the parts that the artery had not been included in the ligature.* In France, Professor Sedillot has tied the common carotid for the suppression of hæmorrhage following a stab behind the right branch of the lower jaw;† and I have myself lately recorded an instance in the *Provincial Medical Journal,* in which I tied the common carotid in a very similar case.‡ I have also tied the popliteal artery on account of secondary hæmorrhage in a gun-shot wound.

But to return to the subject of aneurism. Dr. Horner, of Philadelphia, in a paper published in the *American Journal of Medical Sciences,* October, 1842, has endeavoured to prove the necessity of applying a ligature below as well as above the sac.§ His opinion is founded on the result of three cases occurring in his own practice, two of which were varicose aneurism, and the third an ordinary case of inguinal aneurism. My own opinion, founded on the experience of several cases, is that in varicose aneurism the sac should be laid open, and a ligature applied above and below the aperture in the artery. But these cases are not at all parallel with those of common aneurism; and I do not think that in the latter Dr. Horner's recommendation is likely to be adopted.

* *New York Medical Gazette,* Feb. 9, 1842, and *Medico-Chirurgical Review,* October, 1842.

† *Gazette Medicale de Paris,* and *Provincial Medical Journal,* June 3 1843.

‡ *Provincial Medical Journal,* June 10, 1843.

§ *American Journal of Medical Science,* October, 1842, and *Provincial Medical Journal,* December 17, 1842.

Having mentioned, in enumerating the operations of the past year, a case in which Brasdor's operation was performed, I am led to the notice of a memoir, read by M. Diday at the Academy of Medicine, Paris, on the rules which should guide the surgeon in applying this method to the treatment of aneurism of the innominata, or its branches near their origin.*

It would occupy too much of our time to enter into a full statement of the conclusions at which he arrives, but I think the most important of them ought to be mentioned. They are as follows:—That the subclavian and carotid should both be tied, the ligature of either alone being insufficient to cure the disease. That it is better to tie them both at the same time than separately; but that if the surgeon decides on tying them successively, it is better to commence with the carotid, unless there are any special reasons to the contrary. One very powerful argument in favour of this plan is, that statistics show that the ligature of the carotid is exactly one-half less dangerous than that of the subclavian or axillary artery. As a general rule the second artery should not be taken up until the first operation has ceased to produce any effect on the aneurismal tumor.

A consideration of the very small proportion of cases of aneurism which admit of relief by an operation, suggests the great importance of cultivating other modes of treatment. Although the usual course of internal aneurism is to a fatal termination, yet it is not invariably so; and there is

* *Provincial Medical Journal*, September 24, 1842.

sufficient evidence to prove that even aneurism of the aorta may undergo a natural process of cure. Much may be done to assist the efforts of nature; and it is probable that examples of a favourable issue would be more frequent if we could induce patients to submit to the necessary treatment for a sufficient length of time.

A natural cure takes place most frequently when the aneurismal tumor meets with some obstacle to its expansion, the effect of which is, that the artery is compressed by the tumor itself, and becomes obliterated. Several cases of this kind are on record, and it gave me great pleasure to hear, a few days ago, of a very recent one in the person of a gentleman, who is the son of a very distinguished surgeon now deceased, and with whose friendship I was honoured during his life. These cases hold out great encouragement for the trial of well-regulated compression, and there are, in fact, no less than four cases recorded which have been successfully treated by this method during the past year. They are related in the *Dublin Medical Journal,* and occurred in the practice of Mr. Hutton, Mr. Cusack, and Dr. Bellingham.* Besides these, another case is referred to, which was successfully treated in the same manner by the late Mr. Todd; and I had myself a case under my care in the Leeds Infirmary, some years ago, in which a cure followed the use of compression, which had been applied for some time before the patient's admission.

I must pass hastily over the remaining affections of the vascular system, and, indeed, I find nothing

* *Dublin Journal of Medical Science,* May, 1843.

new with respect to them which need detain us long. A new remedy has been proposed for the cure of nævi by Dr. Sigmund: he has found that the application of the acetum lythargyri, when their size did not exceed that of a hazel nut, caused them to shrink and disappear in the course of three or four weeks. It is employed by means of small compresses dipped in the solution, and renewed three times a day.*

Within the last few years the attention of surgeons has been much directed to the invention of a radical cure for varicose veins, and various methods have been proposed for effecting their obliteration, as ligature, division or excision of a portion of the vein, caustic, &c. Of these methods, that proposed by Velpeau, which consists in passing a pin or needle under the vein, and twisting a ligature round it sufficiently tight to prevent the circulation of blood through it, but not to divide its coats or cause ulceration of the skin, seems to have been the most generally adopted, and has been practised with success during the year. I have myself very frequently used caustic; generally with success, and never with any unpleasant consequences. All the methods I have enumerated have, however, occasionally been followed by dangerous symptoms, and are liable to produce inflammation of the vein. Dr. Watson, of New York, describes a method of applying direct pressure to varices, which he has found successful. He employs a common wax bougie, somewhat larger than the medium size, cut into pieces of an inch or two in length, which are then placed at detached

* *British and Foreign Medical Review*, January, 1843.

points along the course of the varices, longitudinally when the vein is straight, and transversely when formed into tumors, the whole fixed by means of small adhesive straps; a common roller, laced stocking, or starched bandage, is then applied as tightly as the patient can conveniently bear. The ordinary bandage or stocking is said to be the best for the first few days, and the more permanent application afterwards, as soon as the swelling which usually accompanies the varices has subsided.*

M. Vidal de Cassis has published, in the *Annales de Chirurgie Française*,† a memoir on the radical cure of varicocele. He considers this a purely local affection, and thinks an operation for its cure is attended with less danger and less uncertainty than operations for the cure of varicose veins in general; and his opinion is entitled to great consideration, as it is founded on the results of thirty cases. He adopts, with some slight modifications, the operation practised by M. Reynaud, of Toulon, which is as follows:—He lays hold of the spermatic chord of the affected side, separates the vas deferens, which is easily distinguished by its hardness, from the vessels and nerves, and pushes it inwards towards the root of the penis; he then passes a curved needle, armed with a wax thread, under the vessels, brings the two ends together, and ties them over a thick cylinder of linen, previously placed between the thread and the skin. The ligature must be so tied that it may be loosed, in case it should become necessary to diminish the compression exerted on the

* *Provincial Medical Journal*, May 13, 1843.

† *Annales de Chirurgie Française*, 1842, and *Medico-Chirurgical Review*, January, 1843.

parts. A slight degree of inflammation generally arises, but it lasts only a short time, and in two or three days after the operation the ligature may be tightened over a fresh cylinder. The tightening of the ligature from time to time causes the gradual division of the soft parts, which cicatrize gradually from the part where the needle entered; by the 15th or 18th day the spermatic nerves and vessels are cut through, and there remains only the skin undivided. M. Reynaud, then, not to leave a doubt as to the perfect section and obliteration of the vessels of the chord, passes a grooved director, and divides the remaining integument with the bistoury.

The modifications introduced by M. Vidal consist in the substitution of a piece of silver wire for the waxed thread, and in not dividing the integument, when by drawing a little on the ends of the wire, he finds the vessels are divided.

There can be little doubt that in a majority of cases an operation of this kind would be effectual for the cure of varicocele; but before we have recourse to it, it is important to inquire whether it will not produce atrophy of the testicle, and render it unfit for the performance of its functions. M. Vidal seems to think it will not; but that opinion is hardly consistent with his proposal to extend the application of the operation to the treatment of incurable tumors of that organ. In cases of this kind he says that if the ligature does not effect a definitive cure, it may arrest the disease, prevent its ulterior development, and, if it be malignant, oppose an obstacle to its propagation; at all events, he adds, it may be preparatory to extirpation, and afford a

better chance of success to the latter operation. This is an important suggestion, and appears to me to be worthy of notice.

But to return to varicocele. A new mode of treating it has been proposed by Mr. Key, which seems, at first sight, very much at variance with our preconceived notions: it consists in the application of a truss. We should imagine, and indeed have been taught, that this would increase the disease by obstructing the return of blood through the veins, and thus increasing their distension; but it is believed that the evils arising from this cause will be more than counterbalanced by relieving them from the weight of the superincumbent column of blood. The pressure should not be so great as to obstruct the spermatic artery, which would endanger the integrity of the testicle. Some cases are recorded by Mr. Curling, in his valuable work on the "Diseases of the Testis," &c., in which this mode of treatment had been successfully adopted. If further experience should confirm its efficacy, we shall be relieved from a great dilemma in the treatment of those cases in which varicocele and hernia co-exist. I felt myself in this dilemma in a case in which I was consulted a few months ago, occurring in a young gentleman only 15 years of age. I recommended the application of a truss, on the ground that the hernia was the more important complaint, although I feared that the varicocele would be aggravated by it, not being aware at that time of Mr. Key's proposal to treat the latter disease by the application of a truss. Anxious to learn the result, I wrote last week to the surgeon who sent the

patient to me, and had the pleasure of receiving from him a very satisfactory report of the present state of the case. The following is an extract from the letter:—"I have very great pleasure in informing you that Master —— is much better of the varicocele; in fact, the difference between one testicle and the other is so slight as scarcely to be distinguishable. His general health is good; he is on his legs a great part of the day, and can bear a deal of walking exercise. (Previously to the application of the truss he could not bear even to sit with his legs hanging down during the latter part of the day.) The truss has not been worn during the whole of any day by my patient, but so many hours at a time. It certainly has acted in this case admirably, and the result is such as I never could have anticipated."

M. Gorré, surgeon to the Boulogne Hospital, has recorded a case in which instantaneous death followed the introduction of air into a wounded vein, during the removal of a tumor from the neck.* The general opinion hitherto has been that death is produced in these cases by the distension of the heart with air, by which its contractions are prevented; but M. Marchal de Calvi† thinks that this does not explain those cases where the death is so frightfully sudden as if the patient had been struck by lightning, and which resembles the immediate effect of a poisonous dose of prussic acid. In these cases, he thinks, there must be some toxic agent, and that agent he believes to be carbonic acid gas,

* *Provincial Medical Journal*, November 12, 1842.

† *Annales de la Chirurgie*, and *Medico-Chirurgical Review*, April, 1843.

the presence of which he has discovered in the heart. He strongly advises the immediate employment of blood letting, and if it cannot be obtained from a vein would open an artery. M. Gorré thinks that in the case alluded to the introduction of the air was favoured by the tractions exercised on the tumor at the moment the vein was opened. Dr. Godemer, of Ambriéres*, in whose practice three similar cases have occurred, agrees with M. Gorré in attributing the fatal occurrence to the movements given to the tumor in dividing the circumjacent cellular tissue, with a view of removing the diseased growth whole: he, therefore, recommends that it should be removed piecemeal, and says that since he has adopted that plan he has not lost a single patient, although he has performed several operations of the same kind. In a case operated on by M. Asmus, when air was introduced through a wound in the internal jugular vein, the patient, although attacked with convulsions alternating with faintings, which continued the whole day, ultimately recovered.

THE NERVOUS SYSTEM.

There are no injuries productive of a more interesting series of phenomena than those of the brain and medulla spinalis, and none of which the treatment requires greater judgment and discrimination on the part of the surgeon, or in which practical experience is of more value. The important papers of Mr. R. Alcock on this subject, although comparatively recent, do not fall within the limits of my

* *Medical Gazette*, November 18, 1842.

retrospect, and indeed were alluded to by Mr. Dodd in the last address. Since that time a useful practical work on injuries of the head has been published by my relative, Mr. William Sharp, late senior surgeon to the Bradford Infirmary, but I do not meet with the exposition of any new views respecting the treatment of these injuries, excepting in a communication from Mr. Overend to the Sheffield Medical Society.* These views are founded upon a case of very extensive fracture of the skull, accompanied with laceration of the dura mater, and extravasation of blood under the left middle lobe of the brain. The symptoms in this case were not commensurate with the degree of injury, which Mr. Overend attributed to the laceration of the dura mater relieving the compression which would have resulted from the effusion; and he therefore suggests that in those cases of fracture of the skull where the trephine has failed to relieve the symptoms of compression, the dura mater should be divided. This suggestion may be worthy of further consideration; but before we adopt the plan recommended, it ought to be recollected that division or laceration of the dura mater is almost universally followed by hernia cerebri.

Our attention has been directed in a very recent number of the *Provincial Medical Journal*,† to Mr. Crowfoot's paper in the last volume of our *Transactions*, recommending extension in the treatment of fractures of the spine; and the views of Mr. Crowfoot have been confirmed in the very last number of our *Journal* by Mr. Toogood, who relates some

* *Provincial Medical Journal*, November 12, 1842.

† *Ibid*, June 3, 1843.

cases in which he is of opinion that such a mode of treatment might have been successful.* The suggestion is an important one, and I think ought to be acted upon in all cases in which, as in that of Mr. Crowfoot, the deformity of the spine can be diminished by extension. In other cases I should fear it would not be of much avail.

In the *Journal de Medecine de Lyons,* M. Brun reports a case in which he removed some tumors which were developed in the course of the median nerve. The examination of these tumors after their removal led him to raise the question as to the absolute necessity of dividing the nerve above and below the tumor in such operations. He believes that in many cases the nervous filaments do not partake in the degenerescence, and that by a careful dissection the morbid growth may be isolated and removed.†

The advantage to be derived from the use of electricity and galvanism in affections depending on the want of nervous energy, has derived confirmation from some cases which have been reported during the year. M. Jobert‡ has cured several cases of deafness dependant on paralysis of the acoustic nerve by electro-puncture,§ and the *Lancet* quotes a case from an Italian journal, in which aphonia from paralysis of the muscles moving the tongue and larynx was cured by galvanism.‖

* *Provincial Medical Journal,* July 29, 1843.

† *Journal de Medecine de Lyons,* and *Provincial Medical Journal,* March 4, 1843.

‡ *Provincial Medical Journal,* May 27, 1843.

§ *L'Examinateur Medicale.*

‖ *Provincial Medical Journal,* June 10, 1843.

Amongst the affections of the nervous system must be classed hydrophobia and tetanus. In both these diseases the Indian hemp has been used with great advantage.* Several cases of tetanus appear to have been cured by it; and in others which terminated fatally, as well as in hydrophobia, the sufferings of the patient appear to have been greatly mitigated by it. Two cases of tetanus are also reported by Mr. Brown in the *Bengal Transactions*, which were successfully treated with tartar emetic.†

THE ABDOMEN.

Hernia is a subject so important and so interesting, that I must be allowed to devote to it a rather more extended notice. Some cases which have occurred during the past year, induce me to refer in the first place to the diagnosis. A mistake here may be followed by the most serious consequences, and yet mistakes are, I believe, not very infrequent. In most instances the mistake, it is to be feared, is owing to the carelessness or the ignorance of those who make it; but cases do occasionally occur where the diagnosis is very difficult. In the last number of the *Guy's Hospital Reports* a case is recorded in which a tumour in the scrotum was mistaken for hernia, and under that supposition the taxis was used with very injurious effect to the patient.‡ A female applied to me at the Infirmary a few weeks ago for a truss, bringing with her a certificate from a surgeon that she had an inguinal hernia. The

* *Provincial Medical Journal*, February 4, 1843.

† *Ibid*, July 8, 1843.

‡ *Guy's Hospital Reports*, April, 1843, p. 172.

case, on the first glance, certainly bore a considerable resemblance to it; but I found on a careful examination that it was a large varix of the labium. I have even seen an operation performed on the supposition that the patient was labouring under symptoms of strangulated hernia, when no hernia existed. I mention these cases in order to direct your attention to this subject, not only with a view to enforce the necessity of a careful use of those means of diagnosis which we already possess, but in the hope of leading to the discovery of new ones.

An operation has been performed for the radical cure of exomphalos, by M. Bouchacourt, surgeon, to La Charité at Lyons.* It consisted in pinching up the integuments, passing through the base a needle armed with a double ligature, and tying one on each side; a third was afterwards tied round the whole. If this can be done without including the peritoneal sac, it may very properly be practised in those cases which resist the ordinary means of treatment; but if not, notwithstanding the successful issue of this case, I think it not likely to come into general use. The application of a ligature round the neck of the sac for the radical cure of hernia is an old operation, which, although occasionally successful, has long been discarded on account of the dangerous, and often fatal, peritoneal inflammation resulting from it. A very remarkable case is recorded in a recent number of the *Provincial Medical Journal*, by Mr. Parsons, of Bridgewater, in which a case of hernia was radically cured by

* *Bulletin de Therapeutique*, and *Provincial Medical Journal*, Aug. 6, 1842.

an operation performed by a patient on himself.* Being unable to return the protusion, as he had been accustomed to do, in a fit of impatience he made a cut with a razor across the neck of it. This was followed by copious hæmorrhage and syncope, during which the hernia retired, and never afterwards came down. There is no doubt that he divided the neck of the sac, which became closed in consequence by the adhesive process; but it seems very probable that he also wounded the intestine. Upon the whole I fear that this cannot be recognized as a legitimate operation for the radical cure of hernia.

Means of Effecting Reduction.—The first of these is the taxis, for the performance of which some new rules are laid down by Lisfranc.† It is usually recommended that during the employment of the taxis the walls of the abdomen should be placed in a state of relaxation, but Mr. Lisfranc objects to this for the following reasons:—1. When the parietes of the abdomen are relaxed, they are applied upon the viscera contained in its cavity, the capacity of the latter is diminished, and the displaced parts are returned with less ease; 2. The relaxed walls of the abdomen will yield to the fingers during the attempt at reduction; 3. The relaxation of the walls of the abdomen prevents the formation of a hernia, while a tense condition tends to produce it. For these reasons he places the parietes in a state of moderate tension, which, he says, facilitates the reduction.

* *Provincial Medical Journal*, May 20, 1843.

† *Medico-Chirurgical Review*, January, 1843.

I only find the report of one case of strangulated hernia reduced by the use of the long tube, as recommended by Dr. O'Beirne,* from which such great hopes were entertained. I used it myself, a few weeks ago, in a case of strangulated femoral hernia, without success.

Large doses of opium have been successfully administered. Four cases are quoted, in the *Provincial Medical Journal*, of January 14th, from the New York *Medical Gazette*. Another successful case is reported by Mr. Lyell, of Newburgh, Fife, in which very large doses of morphia were given. It was given with great relief to the symptoms, although not with complete success in effecting reduction, in some of the cases reported by Mr. Poland in the *Guy's Hospital Reports*. My brother, Mr. Richard Hey, informed me lately that he had succeeded in procuring the reduction of a strangulated hernia, by large doses of opium combined with tartarized antimony in a patient admitted into the York County Hospital. It is to be observed, that in most of the successful cases its use was preceded or accompanied by copious bleeding, or the administration of nauseating medicines, or of both; and although these means had not proved sufficient to effect the reduction of the hernia, they had no doubt prepared the way for the successful exhibition of the opium.

M. Vela and other French surgeons have succeeded in effecting the reduction of hernia by the external application of ether.† One advantage of

* *Medical Gazette*, May 26, 1843.

† *Gazette des Hospitaux*, and *Lancet*, December 3, 1842.

this remedy is, that its beneficial effects are very quickly produced, so that a trial of it does not involve much loss of time. I have lately had the opportunity of testing the value of this remedy in two cases. The first was that of a man aged about 50, who was labouring under a strangulated inguinal hernia. The tumor was not very tense, nor very painful, although it had been strangulated about twenty-three hours, and the scrotum was slightly excoriated by the attempts of the patient to reduce it. Having applied the taxis without success, I irrigated the tumor with ether for about eight or ten minutes; and on applying the taxis again, I succeeded in reducing the hernia. The subject of the second case was a young man about 20 years old, who was admitted into the Infirmary with a congenital hernia of the right side, which had been strangulated seven or eight hours. The tumor was very tense and painful on pressure, and the application of ether was not attended with success. He was operated on, and the stricture, which was situated at the internal ring, was excessively tight. He had some peritonitis after the operation, but recovered.

Another remedy is the internal use of ice, administered in the form of injection.* In addition to its efficacy in promoting the return of the protruded intestine, Dr. Trusen, of Posen, who recommends it, considers it superior to any known remedy in allaying the sickness and vomiting which are usually present in strangulated hernia. He gives a clyster containing lumps of it as large as a hazel nut, every five or ten minutes.

* *Hufeland's Journal*, and *Lancet*, February 18, 1843.

There are also some cases recorded by Dr. F. Fisher, of Tambach, in which, after the failure of other means, reduction was effected while the patient was in a state of narcotism, produced by injecting an infusion or decoction of belladonna leaves.*

I cannot quit this part of the subject without making the remark, that while we ought to hail the announcement of any new remedy which, on intelligible principles, promises the reduction of a strangulated hernia, we must be somewhat jealous of the multiplication of pleas for deferring an operation. As it is, the operation is often too long delayed, even in the practice of distinguished hospital surgeons, of which, if I mistake not, there are examples on record during the past year. How much more likely is this to be the case in the practice of those who, from the want of experience, shrink from the performance of a delicate operation like this, and think they have a fair excuse for putting it off as long as any means which have been successful in other instances remain untried.

It is impossible however to fix or even to approximate to the fixing of a period beyond which the operation ought not to be delayed. A case is recorded by Mr. Prankerd, of Langport, in the *Provincial Medical Journal,* of December 21st, 1842, in which reduction was effected after strangulation had existed nearly seven days. In two cases recorded by myself a few weeks ago,† in which I operated when the strangulation had existed less than

* *Schmidt's Jahrbücher,* and *Medical Gazette,* August 19, 1842.

† *Provincial Medical Journal,* June 24, 1843.

half that period, the intestine proved gangrenous. In a case reported by Mr. Poland, in which Mr. Key operated thirty-four hours and a half after strangulation took place, the intestine was found gangrenous, and the patient died.* In another case reported by Mr. Poland, and operated upon by Mr. B. Cooper only 12 hours after strangulation took place, the intestine was excessively congested, the patient died, and in the *post-mortem* examination the intestine was found ruptured.† I repeat, then, that we cannot fix the precise period at which the operation ought to be performed—that must be left to the judgment of the surgeon in each individual case; but let us leave it with this caution, that it is better to operate too soon than too late.

This leads to the consideration of the operation itself. One of the most important questions connected with it is that of the division of the stricture and return of the intestine without opening the sac, as proposed by Mr. Aston Key. Of course it is not intended, and would be found impracticable, to apply this mode of operating to all cases. There are several cases recorded during the past year in which, after the division of the stricture exterior to the sac, the hernia could not be reduced,‡ and it was found necessary to open it. But the question is, whether it is safe and advantageous to return the hernia without opening the sac in those cases in which it can be done. In a communication with which Mr. Key favoured me a few weeks ago, he

* *Guy's Hospital Reports*, April, 1843.

† *Ibid.*

‡ *Ibid*; also *Provincial Medical Journal*, June 24, 1843, and *Medical Gazette*, November 11, 1842.

states that this mode of operating has lost none of its advantages in his view, and that he always practises it when he sees it can be done; he states, also, that in his hands it has been uniformly successful, and this statement is confirmed by the result of several cases reported by Mr. Poland.* Two of the cases, indeed, reported by Mr. Poland (one operated on by Mr. Callaway, the other by Mr. Cooper,) terminated fatally; but a perusal of them will not create any impression unfavourable to the mode of operating, as they would in all probability have died in whatever way the operation had been performed. There is, however, a case recorded by myself in a recent number of the *Provincial Medical Journal*,† which proves that the reduction of the intestine, without opening the sac, is not always unattended with danger. It bears so strongly upon this point, that I must beg leave very briefly to state the particulars of it. The subject of it, a female, aged 66, had a large femoral hernia of the right side, which at the time of the operation had been strangulated forty-four hours and a half. I divided the stricture without opening the sac, but could not reduce the hernia, and therefore proceeded to open the sac. I found a considerable mass of omentum, but *no intestine*. The wound was closed; but two days afterwards, on account of its being inflamed and showing no disposition to unite, the stitches were cut out, and a poultice applied. On the sixth day there was a discharge of fæces from the wound, and a complete artificial anus was established.

* *Guy's Hospital Reports*, April, 1843.

† *Provincial Medical Journal*, June 24, 1843.

It is evident that in this case a small portion of intestine had been contained in the sac, which no doubt was reduced after the division of the stricture exterior to it, and before it was opened. If I had been aware that I had reduced the intestine I should not have proceeded to open the sac, and the patient must have died, or at least have been placed in circumstances of imminent danger, from the consequences of extravasation of the fæcal matter into the peritoneal cavity.

If, then, the return of the intestine without opening the sac is highly advantageous in some cases, but dangerous in others, it is important that we should have some principles to regulate our practice with reference to this point. These must be founded on a more extended observation of facts; and I would, therefore, urge those members who have had, or may have, any experience on this point, to communicate the results of it through the medium of our journal to the Association and the profession generally. In the mean time I would suggest that in all cases where the symptoms of strangulation are very acute, where strangulation has existed long, where violent attempts at reduction have been made, and, above all, where inflammation has extended from the sac to the integuments covering it, it would be unsafe to return the intestine without ascertaining its actual condition. In cases where the symptoms are less urgent, and there is no reason to suspect that the intestine is in a bad condition, it will be proper to return it without opening the sac. I should think this particularly desirable in cases of large scrotal hernia, in order

to avoid the exposure and handling of so extensive a peritoneal surface as is sometimes implicated. For example, a case read by Mr. Overend before the Sheffield Medical Society, is recorded in the *Provincial Medical Journal*,* in which, on laying open the sac, "*between four and five feet of intestine rolled out.*" Of course I cannot undertake to say that this could have been reduced without opening the sac, but I think it would have been very desirable to make the attempt.

In the *Guy's Hospital Reports* for last year† there is a very valuable paper by Mr. Key, "On the Proceedings to be Adopted in a Case of Injured Intestine from a Blow upon a Hernial Sac," the consideration of which seems naturally to follow the preceding subject. When a blow is inflicted on a hernial sac, the intestine which is contained in it may be injured in various degrees. There may be contusion so slight as merely to produce some degree of inflammation in the part, which may not be followed by any serious consequences; or it may be so severe as to lead to sloughing of the intestine; or the intestine may at once be ruptured. The consequence of these two latter degrees of injury is fæcal extravasation into the cavity of the abdomen, followed by fatal collapse.

In order to prevent this result by affording an outlet to the offending fluids, Mr. Key proposes to lay open the sac. The period at which this is to be done depends on the symptoms present. We must not rashly cut into the sac in every case in which a

* *Provincial Medical Journal*, May 6, 1843.

† *Guy's Hospital Reports*, vol. vii.

blow has been received upon it, but must wait to see whether dangerous consequences are likely to result. If there is a considerable rupture of the bowel, giving rise to instantaneous effusion, the symptoms at once assume a character too marked to be mistaken, and no time should be lost in making an opening. When the opening is so small as to prevent, for a time, any escape of the contents of the intestine, or when it is the result of sloughing following a severe contusion, there is no necessity for taking any decisive step until it is called for by the unequivocal collapse and pain that attend extravasation.

The paper contains the report of four cases, two of which present examples of the successful application of the treatment recommended. In the other two, which terminated fatally, it seems very probable that life might have been preserved by a similar operation.

On the subject of artificial anus I have nothing new to communicate beyond the remark that the history of the two successful cases in the paper we have just been discussing, and of the two cases published by myself in a recent number of the *Provincial Medical Journal*,* leads me to infer that the parts are much more favourably circumstanced for the production of a natural cure when a gangrenous portion of intestine is returned into the abdomen than when it is left in the sac.

There is one point in the operation for strangulated hernia respecting which the practice seems not quite settled. I refer to the disposal of the

* *Provincial Medical Journal*, June 24, 1843.

omentum. When a portion of omentum, which has been recently protruded, is found in good condition, of course it must be returned; when it is found gangrenous it is usual to cut it off; but I think no uniform rule of practice is recognized for the treatment of omentum which has been long protruded. In looking over the history of cases which have occurred during the past year, I find that it has sometimes been cut off, and sometimes left in the sac. I would suggest its removal in every instance. When it has been long protruded it is always thickened and indurated, and if returned into the abdomen acts as an extraneous substance, producing great irritation or even inflammation; if left in the wound it interferes with the accurate adaptation of a truss afterwards. The excision of it does not seem to add to the danger of the case. I operated on a case of femoral hernia a few weeks ago, which had been strangulated nearly three days, and removed a considerable portion of irreducible omentum. The patient recovered without any unfavourable symptom. In one of the cases which I have published, and to which I have already had occasion to refer, the same practice was adopted, and the patient recovered. Besides these, several other cases have been put on record during the year in which portions of omentum were removed without any injurious consequences. Although, then, I should not think it justifiable to open the sac for the purpose, I think it so great an advantage to get rid of a lump of irreducible omentum, that I would never neglect the opportunity of doing it in any case in which the opening of the sac was necessary on other accounts.

The attention of the profession has been lately drawn by Mr. Luke, in a paper read before the Medico-Chirurgical Society,* to the subject of hernia reduced "*en masse,*" which he thinks not so infrequent as has generally been supposed. He has himself seen five cases of it. In the same number of the *Provincial Medical Journal* in which this paper is noticed, a very remarkable case is also quoted from the *Annales de la Chirurgie Française,* which is supposed by Velpeau to have been of this nature. The circumstances of it are, however, very peculiar, and I refer you to the account of them in the number of the *Journal* of May 13th. The diagnosis of these cases is extremely obscure; but whenever the symptoms of strangulation continue after the reduction of a hernial tumor, there is ground for suspecting that the sac has been returned along with its contents, which remain strangulated within it. The mode of proceeding to be adopted is this: the inguinal canal must be laid open to such an extent as to allow the operator to introduce his finger through the internal ring into the abdomen, in order to ascertain the state of affairs. If the hernia has been reduced *en masse,* he will feel the sac constituting a tense round tumor. The internal ring must then be dilated sufficiently to allow of its being drawn down, when it must be opened and the stricture divided.

I believe that previously to the publication of this paper the subject had engaged the attention of Mr. B. Cooper. He had recommended that in cases where the symptoms of strangulation continue after the reduction of a hernia, endeavours should be made to procure its re-descent, and, if that could

* *Provincial Medical Journal,* May 13, 1843.

not be accomplished, he suggested that an opening should be made into the abdomen, as proposed by Mr. Luke; but I am not aware that he ever performed that operation. The subject, however, is most important, and the thanks of the profession are due to both these gentlemen for the light they have thrown upon it.

A case is reported by Mr. Banner, of Liverpool, in the *Provincial Medical Journal* of February 11th, which, although not of the same nature as Mr. Luke's cases, confirms the propriety of performing an exploratory operation in cases of hernia, when the symptoms of strangulation continue after apparent reduction. In this case the contents of the tumor had disappeared under the use of the taxis, but the patient was not relieved; and on examination after death, "a small knuckle of intestine was found just within the inner ring, strangulated by the sac."

It only remains for me to mention, in connexion with this part of my address, that the operation for strangulated hernia has been successfully performed during the past year upon a man aged 107 years, by Mr. Cæsar Hawkins.* He has also put on record a case in which he operated with success upon a child aged seven weeks.† These cases, I believe, present the extremes of age at which this operation has been performed; and it is very remarkable that they should both have occurred in the practice of the same individual.

The past year has been signalized by the suc-

* *Medical Gazette*, December 9, 1842.

† *Ibid*, December 30, 1842.

cessful performance of several operations for the removal of ovarian tumors from the abdomen. Dr. Clay, of Manchester, has recorded five cases, of which three were successful; and Mr. Walne, of London, one successful case.* The management of these cases does great credit to the judgment of the operators, and a perusal of them cannot fail to convince us of the great advantage of the large abdominal section in the removal of these tumors. Some other cases have been put on record during the year, which show the extent to which the peritoneum may be injured without fatal consequences. Mr. Toogood, in a case of penetrating wound of the abdomen, reported in the *Provincial Medical Journal*, December 17th, 1842, found it necessary to pass sutures through the peritoneum, in order to prevent the protrusion of the intestines; and in another case which occurred to M. Wolfgram, of Berlinchen, the abdominal parietes were torn open to such an extent that the stomach, the lacerated omentum, the colon, and the small intestines, protruded, so that the patient was obliged to support them with his hands, notwithstanding which he recovered in fifteen days.†

At a meeting of the Academy of Sciences in Paris, February 27th, 1843, M. Amussat exhibited several children in whom he had performed the lumbar operation for artificial anus, one of whom is now $8\frac{1}{2}$ years old, and healthy.‡ Since the notice of this subject in the last address on Surgery, although

* Mr. Walne has, since this was written, operated on two other cases with success.

† *Caspar's Wochenschrift*, and *Prov. Med. Journal*, March 18, 1843.

‡ *Provincial Medical Journal*, February 18, 1843.

not within the last year, the operation has been performed twice in this country, once by Mr. Jukes, and once by Mr. Teale. At the latter operation I assisted; and although the patient did not recover, I have not the least doubt that her life was prolonged by it, and that if it had been performed earlier the result might have been successful. There are several cases reported during the year of constipation continuing for a very long period; in one case forty-five days,* in another forty-three days,† and in a third eighteen days.‡ The cause of the constipation in all these cases was mechanical obstruction, produced by an impervious stricture. Might not these cases have been much relieved, and life prolonged, if not saved, by a recourse to the operation in question?

In the *Archives Generales de Medecine,* October, 1842, Dr. Lecanu reports a case of ascites in which the operation of tapping had been performed 886 times, and which was cured by compression of the abdomen, applied by means of a tight bandage.

THE PELVIS.

Urinary Organs.—The different morbid states of the urine, and the means of correcting them, I leave to my colleague, Dr. Shapter, and shall confine what I have to say respecting calculous disorders to the consideration of the methods which have been proposed for removing a stone when it is actually formed in the bladder. This is a subject which has always

* *Lancet,* November 26, 1842.

† *Ibid,* December 17, 1842.

‡ *Ibid,* December 31, 1842.

engaged and still continues to attract a large share of the attention of the profession.

Dr. Willis, in a recent work,* speaks favourably of the old practice of attempting to dissolve the stone by the use of solvents, either taken by the mouth or injected into the bladder, the beneficial effects of which, he thinks, have been underrated. Some cases are recorded in his book in which a considerable degree of success attended the use of each of these methods; and, of course, more is to be hoped for when they are used in conjunction.

It is to be feared, however, that very few cases will be cured by this treatment, and it will generally be found necessary to have recourse to mechanical means for removing the stone from the bladder. Leaving out of our consideration the extraction of calculi through the urethra, which is only applicable to a very small proportion of cases, we have the choice of three other means, viz., lithotomy, lithotrity, and lithectasy. The operation of lithotrity, which consists in the crushing of the stone in the bladder, has hitherto been thought applicable only to patients above the age of puberty; but it appears, from a communication by M. Ségallas to the French Academy of Medicine, that he has succeeded in applying it at every age; and he exhibited a child, aged 23 months, on whom it had been performed. Messrs. Viricel, of Lyons, Payen, of Aix, and Vidal, of Cassis, have also lately declared in favour of this practice. Sir B. Brodie, in the last edition of his lectures on the diseases of the urinary organs, has expressed a favourable opinion of lithotrity when applied to

* "On the Treatment of Stone in the Bladder," by R. Willis, M.D

proper cases; but he says, that under the age of puberty lithotomy is too successful to be relinquished. Upon the whole, lithotrity has by no means advanced in public estimation, and has greatly disappointed the expectations that were at first entertained from it. The picture drawn of its results by Dr. Willis is a very dark one; and he has proved, by reference to a very extensive series of cases, that when used indiscriminately it is both more painful and more dangerous than lithotomy.

But, although he decidedly gives the preference to lithotomy as compared with lithotrity, he does not seem to entertain any great affection for the former, and recommends, in preference to either, the operation of lithectasy. This consists in cutting down upon the membranous part of the urethra, and introducing an apparatus, by means of which the prostate gland and neck of the bladder are gradually dilated. He states that these parts may be dilated sufficiently to allow of the extraction of a stone two or three inches in diameter, so that the division of them is rendered unnecessary, and thus the most dangerous part of the operation is avoided. The apparatus used by him is the fluid-pressure dilator of Dr. Arnott. A case is reported by Mr. Elliott, of Carlisle,* in which this operation was successfully performed; but there has not yet been sufficient experience of its merits to justify the declaration of Dr. Willis, that "there is hardly a case to which it is not applicable, and its application is without danger, immediate or prospective." I apprehend that many cases will be found in old persons, or

* *Edinburgh Medical and Surgical Journal.* January, 1843.

those who have long laboured under the disease, when the prostate is enlarged, indurated, and irritable, and the bladder much contracted and diseased, in which probably the necessary dilatation could not be effected; or, if effected, would occasion more pain and constitutional disturbance than the division of the parts.*

Since, then, it does not seem probable that lithotomy will be entirely superseded by either of the operations which have been mentioned, it is highly important that the principal sources of danger in that operation should be ascertained, in order that they may be avoided. That the operation is not so dangerous as is generally supposed, when conducted on correct principles, may, I think, be inferred from the great success which has attended some operators. Without going so far back as to Martineau or Cheselden, I find it reported in the January number of the *Edinburgh Medical and Surgical Journal,* on the authority of Dr. Nott, that Professor Dudley, of Kentucky, has operated on 153 cases, and lost only four of them. When this result is compared with the results of operations for stone in Paris, where, according to Dr. Willis, the average mortality is one in two or three, we cannot doubt, after making every allowance for contingencies, that the difference in the results must be ascribed to some essential difference in the mode of operating.

* The very first number of the *Provincial Medical Journal* which was published after the reading of this address, that of August 5th., contains the report of a case operated on by Professor Fergusson, which fully confirms this opinion. I had not heard of the case previously to its being reported in the *Journal.*

The opinion entertained by Sir B. Brodie, Liston, Key, Fergusson, and most of our eminent lithotomists, is that the chief source of danger is infiltration of urine into the cellular tissue about the neck of the bladder, and that the best means of obviating the risk of this is to make a large external incision, and a small internal one, so that the deep pelvic fascia may not be divided. If a very small incision is made through the prostate it readily yields, either by dilatation or laceration, so as to admit of the extraction of a large calculus. Mr. Syme, on the other hand,* thinks this mode of proceeding highly dangerous, and recommends to cut freely through the whole thickness of the gland, affirming that in no case has any bad consequence resulted from so doing. Dr. A. Monro is also of opinion that the division of the pelvic fascia is not so fatal as has been supposed.† I must give my vote in favour of the small incision through the prostate, which I have found very successful in my own practice.

In order to avoid cutting through the prostate, however, it is necessary for the internal incision to be very small. Mr. Bryan, in a paper on lithotomy,‡ states that if the incision through the neck of the bladder be made to the extent of three quarters of an inch downwards and outwards, the prostate will be completely divided, and the vesiculæ seminales wounded. In the dead subject, he says, the longest possible incision in the prostate, without completely

* *Edinburgh Monthly Journal*, December, 1842.

† *Medico-Chirurgical Review*, July, 1842.

‡ *Lancet*, February 11, 1843.

dividing it, is about eight or nine-tenths of an inch. But the wound, together with the neck of the bladder, will stretch so as to allow a round body of more than four inches in circumference to pass without tearing.

Mr. Fergusson has illustrated the advantage of a very long external incision when the perinæum is very fat. In a case of this kind he made an incision fully six inches in length, and in some clinical remarks on the case, he observed that there is an utility in such an incision, which appears to have been overlooked: it is, that after the skin has been divided, although the point of the knife may have been thrust half an inch deep, when the edges of the wound separate, the fat and cellular tissue seem to be on the same level as the skin; in other words, the perinæum is made half an inch shallower. On the other hand, if the external incision is a short one, instead of the edges separating and permitting a ready access to the deeper parts, they will form a tight band over the fore-finger of the left hand, when it is thrust towards the neck of the bladder.*

Mr. Bryan, in the paper before referred to, has proposed a new lithotomy staff, a priority in the discovery of which, however, is claimed by Mr. G. W. James.† It only differs from Mr. Key's in having the groove on the concave side, and does not appear to me to possess any material advantage over it. I avail myself of this opportunity of stating that I always use Mr. Key's staff and knife, the introduction of which has, I think, very much simplified the operation of lithotomy.

* *Provincial Medical Journal*, March 4, 1843.

† *Lancet*, March 11, 1843.

The foregoing remarks apply of course only to the lateral operation, which is the one generally received in this country; it appears however, that the high operation has been pretty extensively practised by MM. Belmas and Souberbielle, in Paris, and it is probable that it might be used with advantage in those cases where the calculus is very large.

Next to calculus, one of the most important diseases of the urinary organs is stricture of the urethra, respecting which a few remarks may be allowed, although I am not aware of any actually new mode of treating them having been introduced during the past year. There have, however, been several important treatises upon the subject within the last few years, and the comparative merits of the various remedies proposed in them affords constant matter for discussion. In the *British and Foreign Medical Review,* published April, 1842, is a notice of several of the treatises alluded to, which contains a very good account of the present state of our knowledge respecting strictures of the urethra, to which I refer you for some valuable information upon this subject. Since that time a memoir of M. Civiale has appeared on the employment of caustics in some diseases of the urethra, amongst which of course stricture is included. This remedy is one respecting the use of which there is still great difference of opinion. The experience of M. Civiale is, on the whole, unfavourable to it. On the other hand, Mr. Wade speaks strongly in its favour, and recommends the potassa fusa, as used by Mr. Whateley. Mr. B. Cooper also recommends the

caustic bougie, and says that a successful result generally follows the application of this instrument. I do not find many reports of cases treated in this way during the year. I have myself tried it in two cases of stricture of very long standing, complicated with fistula in perinæo. In one of the cases I succeeded, after several applications, in passing a small silver catheter into the bladder, but I did not feel certain that this success was due to the caustic. In the other case it entirely failed. Upon the whole I think it may be set down as the more prevailing opinion respecting caustic, that it is most useful in cases of irritable stricture. The most ancient mode of treating strictures, that by dilatation, is the one still in most common use, and the usual mode of effecting it is by the use of bougies gradually increased in size, an interval of a few days being allowed to elapse between each introduction. The plan of introducing bougies in quick succession, so as to effect the dilatation within a few hours, as practised on the continent by Lallemand and others, is not received with much favour in this country, and I am not aware of any reports of cases treated in this manner during the year; nor do I find that the plan of gradual dilatation by fluid pressure, proposed by Dr. Arnott, has come into more general use.

There is a preliminary step necessary for the use of any of these modes of dilatation, viz., to obtain a passage through the stricture; and I have always been accustomed to consider the case more than half cured when that was effected. But I believe that some strictures are incurable by the use of bougies, and then we must choose between the

use of caustic, of what M. Roux calls "Cathéterisme forcé," (*i. e.*, forcing a passage with a conical sound,) dividing it with a lancetted stilette, as proposed by Mr. Stafford, or cutting down upon it through the perinæum. There is so much uncertainty in the use of the caustic, and there are so few hands to which the two other modes can be entrusted, that I must give it as my opinion that the division of the stricture through the perinæum, although apparently a more formidable operation, is attended with the least danger. It has been successfully practised in several cases both by myself and my colleagues in the Leeds Infirmary, and I have had occasion to do it not less than three times during the present year. The first case was that of a boy, who had a stricture following rupture of the urethra, from a blow upon it some months previously. His urine dribbled away, but the bladder was enormously distended, and no instrument could be passed. The second was a very old case of stricture complicated with fistula in perinæo, which had resisted other modes of treatment for months. The operation in this case was difficult, on account of the diseased state of the parts, the perinæum being filled with a mass almost like cartilage, traversed by numerous sinuses; but it was perfectly successful, and the patient can now pass for himself No. 10 metallic bougie. The third was the case of a gentleman, who having suffered many years from stricture, with a gradually increasing difficulty in voiding his urine, was at length attacked with a complete retention; and before I arrived at his residence, which was at a distance of 40 miles, the urethra had given way behind

the stricture, and the penis and scrotum were infiltrated with urine. There was another point of interest in this case, which I may mention *en passant*. Sir B. Brodie says, in his lectures on the diseases of the urinary organs, that when there is a circumscribed black spot on the glans penis, it is an indication of infiltration into the corpus spongiosum, and may be regarded as a certain precursor of death.* In this case there was not a circumscribed black spot, but the whole of the glans penis was livid; and the fact of its being infiltrated is, I think, proved by its subsequent sloughing. The whole penis sloughed away as completely as if it had been amputated, and yet this patient recovered, although he was a very unfavourable subject, being upwards of 60 years of age, and having lived very freely.

Mr. B. Phillips has published some interesting observations on involuntary seminal discharges from the urethra.† These discharges may arise from various causes, such as gleet, stricture, or irritation in the rectum, but the most common cause is abuse of the generative function. They are productive of a most melancholy series of symptoms. Mr. Phillips states that they are always connected with a morbid sensibility of some part of the mucous membrane of the urethra, which is generally a little in front of the prostate. The passing of a bougie over this part occasions great pain. The

* I quoted this opinion of Sir B. Brodie from recollection; but I find, on referring to the third edition of his *Lectures on the Diseases of the Urinary Organs*, that I have over-stated it. He says it is "an almost fatal symptom." Still I think the case of sufficient interest to be put on record.

† *Medical Gazette*, December 16, 1842.

remedy consists in the application of the nitrate of silver to that part. Mr. Phillips says that he has never had occasion to make more than two applications. Of course, when the affection is the consequence of stricture, or of gonorrhœal or gleety discharge, or of irritation in the rectum, the cause must be removed; but the simple removal of the cause is not necessarily followed by the cessation of the effect without the use of the treatment which has been described. A similar mode of treating these affections was recommended some years ago by Lallemand.

I must limit myself to a very short notice of some other affections of the genito-urinary organs, and of the remedies which have been proposed for them during the year. A remarkable case of urinary fistula, situated beneath the umbilicus, is recorded by M. H. Larrey.* It was complicated with stone in the bladder, the removal of which was followed by a cure. There are several notices of vesico-vaginal fistula. Dr. Reid has recommended a palliative remedy, which has been found to render the situation of the sufferer much more comfortable.† It consists in the introduction of an India-rubber bottle into the vagina, which is to be inflated after its introduction by means of a syringe adapted to it.

Mr. Harrison, of the Reading Pathological Society, reports a case treated by passing several threads of silk through the fistula, by means of a curved catheter, and withdrawing one every day. The

* *Lancet*, January 7, 1843.

† *Ibid*, February 18, 1843.

patient experienced considerable relief from the dribbling of urine, but the cure was not perfect at the time of the report.*

M. Lallemand has reported two cases in which he effected a radical cure by means of an operation.† M. Blandin, on the other hand, doubts whether there is a single well-authenticated instance of radical cure, and exhibited to the Academy of Medicine, Paris, a preparation showing that a portion of the ureters had been destroyed by the disease.‡

M. Piorry has cured an intense urethro-vaginitis, of nine months' duration, by injections of an infusion of cubebs, along with the internal administration of the same drug.§

In a recent number of the *Provincial Medical Journal* is reported a case of painful affection of the bladder, attended with constant desire to make water, the patient only being able to void it by drops, which were tinged with blood. The disease was intermittent, being pretty well in the morning and until four o'clock, when the attack came on. It was successfully treated by M. Baumgarten with injections of a very weak solution of nitrate of silver.‖

Incontinence of urine is said to have been successfully treated by the internal administration of ergot of rye.¶

* *Provincial Medical Journal,* August 13, 1842.

† *Archives Generales de Medecine,* March, 1842, and *Provincial Medical Journal,* April 8, 1842.

‡ *Provincial Medical Journal,* April 22, 1843.

§ *Gazette des Hospitaux,* and *Provincial Medical Journal,* May 27, 1843.

‖ *Journal des Connaissances,* and *Provincial Medical Journal,* May 27, 1843.

¶ *Medicinische Zeitung,* and *Lancet,* March 4, 1843.

We have additional examples of the successful treatment of hydrocele by iodine injections. In one of the cases reported there were two distinct sacs; and in another three.* Mr. B. Lucas has cured an encysted hydrocele of the chord by injecting back the fluid that had been drawn off.†

The use of belladonna is recommended in the treatment of phymosis and paraphymosis; and a writer in the *Bulletin Medicale de Bordeaux* says that no section of the prepuce should be made till after the practitioner has attempted to avail himself of the relaxing effects of this remedy.‡

The Rectum.—The *Provincial Medical Journal,* December 17th, 1842, announces a new mode of treating hæmorrhoidal tumors, by Professor Horner, of Philadelphia. His mode of operating is certainly different from that usually practised in this country; but there is nothing new in the *principle* of the operation, which is simply that of removing these tumors by ligature. We are accustomed to use for this purpose a curved needle, armed with a double silk ligature, the needle being passed through the base of the tumor, and a ligature tied round each half of it; but Dr. Horner attacks them with "a thick sail-needle," "a stout awl," and "a wire ligature." I cannot perceive what advantage the wire possesses over the silk ligature; it must be more painful, and, if I may judge from the results of the very numerous operations I have both per-

* *Lancet,* February 25, 1843.

† *Provincial Medical Journal,* December 10, 1842.

‡ *L'Expérience,* December 15, and *Lancet,* January 21, 1843.

formed and witnessed, I should say it cannot be more efficient. There are, however, two good suggestions in Dr. Horner's paper: the one is that of calming the rectum by cold water injections for some days before the operation, and the other is a still more important one. Some hæmorrhoidal tumors are situated so low down in the rectum that when protruded they appear to be covered partly with mucous membrane and partly with skin. The inclusion of any part of the skin in the ligature is always to be avoided, on account of the excessive pain and high degree of constitutional disturbance produced by it; and it may be avoided by following Dr. Horner's suggestion, to detach the inferior third of the base of the tumor with a scalpel, and apply the ligature in the line of the incision.

Dr. Houston, in the *Dublin Journal of Medical Science,* March, 1843, recommends the use of pure nitric acid in the treatment of these affections. It immediately destroys the surface to which it is applied, and when the slough is cast off a healthy suppurating surface is left, which contracts and heals over very quickly.

Dr. M'Cormac has devised a very ingenious mode of treating prolapsus ani in children, by means of which he effected a cure in the case of a girl between five and six years old, who had laboured under the complaint from about a year old. During that period the bowel protruded at every stool, sometimes to the extent of an inch or more, and always required to be reduced. He thought that the relaxed state of the parts might be corrected by careful manual traction, and therefore directed that

when the child went to stool the skin exterior to the anus should be drawn to one side by means of the fingers extended around. The plan succeeded,and there was no descent of the bowel afterwards.*

That very painful affection, fissure of the anus, which generally resists all remedies but the division of the sphincter, has been successfully treated with enemata containing the extract of rhatany root, by M. Bretonneau and others on the continent.†

Some cases have been recorded in which the extraction of foreign bodies accidentally introduced into the rectum has been attended with great difficulty, on account of the violent contraction of the sphincter ani. This has led to the suggestion, by an anonymous contributor to the *Medical Gazette,* of the division of that muscle.‡

THE HEAD AND NECK.

The number of papers in our journals upon subjects connected with ophthalmic surgery indicates the great interest taken by the profession in this branch of the science. I cannot pass without notice some of the more important of them, although the time will not allow me to devote much space to this part of my address. I refer you, however, for some additional information to an article in the *Medico-Chirurgical Review,* July, 1842, on ophthalmological literature.

* *Provincial Medical Journal,* July 29, 1843.

† *Dublin Journal of Medical Science,* January, 1843.

‡ *Medical Gazette,* August 26, 1842.

The *Provincial Medical Journal,* January 14th, 1843, contains some valuable remarks on the subject of cataract, from the clinique of M. Roux, amongst the most important of which are those on the comparative advantages of extraction and depression, of which, from his very extensive experience, having extracted cataract above 6000 times, he is eminently qualified to judge. After a full trial of both these methods he states it as the result of his experience, that the number of complete cures is greater after extraction than after depression; but he admits that the latter operation is more applicable than the former to some cases. There are also some interesting statistics, showing the proportion of successful operations.

In the operation of depression Mr. Morgan has recommended a mode of proceeding to be adopted which has generally been regarded as a proof of awkwardness in the operator, viz., the transfixing of the lens with the needle.* This gives the operator much greater command over it, and enables him to deposit it precisely where he wishes it to be, without breaking up the vitreous humor and hyaloid membrane beyond what is necessary to form a track for it. The needle is to be introduced into the lens by a sort of drilling motion, and withdrawn in the same way, in order to prevent its subsequent displacement.

M. Bernard, of Paris, has had recourse to the subconjunctival method in operating for cataract, the conjunctiva being drawn aside by a hook previously to the introduction of the needle, so that

* *Guy's Hospital Reports,* vol. vii.

the wound in the conjunctiva and that in the sclerotica did not afterwards correspond.*

In order to obviate the difficulty that sometimes arises in these operations from the movements of the eye, M. Bonnet, of Lyons, recommends that it should be fixed by inserting a hook into the sclerotica, as in the operation for strabismus.†

M. H. Cuvier, of Brussels, has noticed the frequency of green cataract, which he thinks is often mistaken for glaucoma, and the patient thus abandoned to darkness. He has met with eight cases of this kind, seven of whom were operated on and restored to sight.‡

In the treatment of some forms of amaurosis strychnine has been administered internally with great advantage for some years past; and it has also been applied externally in the endermic method, the cuticle being removed by blistering, in order to facilitate its absorption; but I am not aware of its having been dropped into the eye in the form of solution. It appears, however, to have been used with success in this manner during the year, in a case which had for three months resisted almost every other remedy, and, amongst the rest, electricity.§ Dr. Clay Wallace, of New York, has reported a case of amaurosis, following a wound over the infra orbitar nerve, which was cured by dissecting out the cicatrix. It was uncommonly pro-

* *Gazette Medicale de Paris*, July, 1842.

† *Journal de Medecine et Chirurgie Practique*, and *Provincial Medical Journal*, August 6, 1842.

‡ *L'Examinateur Medicale*, and *Provincial Medical Journal*, January 14, 1842.

§ *Schmidt's Jahrbücher*, and *Medical Gazette*, August 6, 1842.

minent, and was found to contain a small piece of steel. He treated another case in a similar way, in which also a small foreign body was found in the cicatrix; but the result of the operation was not known.*

Mr. Alexander Ure has reported an interesting case, which very much resembled amaurosis, the patient being totally blind, and the pupil dilated and motionless; but Mr. Ure, suspecting that the case was one of idiopathic palsy of the iris, cauterized the circumference of the cornea with nitrate of silver, as recommended by M. Serres. The result was prompt restoration to sight.†

The application of myotomy to the treatment of some affections of the eye has been already noticed; it therefore only remains for me to mention one or two other cases in which it has been suggested to call in the aid of operative surgery to the relief of this organ. Dr. R. D. Thompson states that the blindness produced by the application of sulphuric acid to the cornea may be cured by dissecting off the conjunctival covering of it, and then scraping the denuded cornea until the whole of the opacity is removed. This he has verified by experiments.‡ It has been ascertained by the experiments of Mr. Feldman and Dr. Davis, of Munich, that the cornea may be transplanted from the eye of one animal to that of another, its transparency remaining uninjured.§ Dr. Ammon, of Dresden, has also transplanted the conjunctiva of the eyeball to the external

* *Medical Gazette*, March 24, 1843.

† *Provincial Medical Journal*, May 27, 1843.

‡ *Ibid*, January 14, 1843.

§ *Gazette des Hospitaux*, and *Lancet*, January 14, 1843.

angle of the palpebræ, in order to establish the normal dimensions of the external canthus when it is too small either from malformation or disease.*

The only internal remedy that I shall mention is the iodide of potassium, which has been recommended in various inflammatory affections of the eyes by Dr. Parrish, of Philadelphia, and others.† It is particularly applicable to those cases which have a constitutional origin, such as struma or syphilis, especially when there is an irritable or cachectic state of the system, which would render the use of mercury hazardous.

M. Gerdy has had recourse to a new operation for fistula lachrymalis, a description of which is given in the *Provincial Medical Journal,* May 13th, 1843.

I find the reports of three cases in which that formidable operation, the removal of the parotid gland, has been performed: one in France,‡ one in America,§ and one in this country, by Mr. B. Travers, jun.‖ In two of the cases a ligature was, in the first instance, placed loosely round the common carotid, which it was found necessary to tighten before the close of the operation. Dr. Valentine Mott, however, has stated that there is much less danger of hæmorrhage when the extirpation of the gland is deferred until the day succeeding the appli-

* *Annales de Chirurgie,* Jan., 1843, & *Provincial Medical Journal,* April 22, 1843.

† *Philadelphia Medical Examiner,* April 16, 1842, and *Provincial Medical Journal,* August 27, 1842.

‡ *Provincial Medical Journal,* September 24, 1842.

§ *Lancet,* November 19, 1842.

‖ *Medical Gazette,* February 24, 1843.

cation of a ligature on the artery than when both operations are performed at the same time.*

The *Dublin Journal of Medical Science*, January, 1843, contains an account of three successful operations for the cure of cleft palate: one by Dr. Cusack, and two by Sir P. Crampton. M. Roux, who has, perhaps, performed this operation more frequently than any other person, (upwards of 100 times,) insists strongly on the total privation of nourishment for five days. On this point Sir P. Crampton differs from him, believing that such a protracted abstinence must cause a state of constitutional disturbance highly unfavourable to the process of union by the first intention; and the successful result of his operations seems to confirm the soundness of his judgment.

The operation of tracheotomy has recently been performed in a case which excited the interest of the public almost as much as that of the profession; I allude to the case of Mr. Brunel, the celebrated engineer. It is worthy of being noticed on account of the peculiarity in the mode of proceeding which was adopted. The opening in the trachea appears not to have been made for the extraction of the foreign body contained in it, but to obviate the risk of suffocation whilst the patient was placed in a position favourable for its escape by gravitation. The operation has been performed in several other cases with variable success. In some cases recorded by Mr. Hilton in the *Guy's Hospital Reports* of last year, the opening was made through the crico-thyroideal ligament, with a lancet-shaped trocar;

* *Lancet*, October 1, 1842.

and when the operation is called for on account of an obstruction to the passage of the air situated in the larynx, this seems to be the simplest mode of performing it. The success which has attended the operation when performed for croup is not calculated to afford much encouragement for its repetition in that disease.

Excision of the tonsils has been recommended in scarlatina anginosa by Mr. Yearsley.*

Besides the subjects which have been mentioned there are several others of sufficient interest and importance to deserve some notice in this address; but a consideration of them all would extend it to an inconvenient length, and I therefore hasten to a conclusion.

It has been the custom to conclude these addresses with a notice of the most eminent members of the profession who have died during the year; and I am unwilling to depart from so good a precedent. I think it good, both because it affords us an opportunity of doing honour to those who have distinguished themselves by their successful cultivation of medical science, and because it may not be without its use that we ourselves should be occasionally reminded, what in the hurry of business we are too apt to forget, that our own turn will one day arrive. The assertion of the poet,

> "All men think all men mortal but themselves,"

is perhaps peculiarly applicable to medical men; for we are so continually brought into contact with death, that our sensibilities become blunted, and

* *Medical Gazette*, December 9, 1842.

those examples of the uncertainty of life which come home with startling effect to others, make but a slight and transient impression upon ourselves. But, so far from our being possessed of any immunity from the common lot of all men, it is well ascertained that our mode of life is very unfavourable to longevity; and it is a fact, which has been alluded to in more than one previous address, that a smaller proportion of the members of the medical profession than of any other attain the age of 70 years.

The records of the profession in this town for the last ten or twelve years abundantly confirm this truth; for during that period several of our brethren have been cut off in the midst of an active career, and in the prime of life; and it is only a few weeks since several who now hear me accompanied the remains of one of their number to their last resting place: I allude to Dr. Hunter, lately senior physician to the Infirmary. He was a good practical physician, laborious in the discharge of his professional duties, both public and private, and ever ready to give the support of his influence and exertions to any measures calculated to promote the interests of his profession, or of science in general. The mention of his name belongs of right to Dr. Shapter; but I am sure he will pardon my trespassing upon his ground so far as to pay this slight tribute to the memory of one who was lately my colleague in the Infirmary and the School of Medicine of this town, and with whom I have been accustomed to act professionally on friendly terms for upwards of 24 years.

At the head of those belonging to my own branch of the profession I had placed the name of the illustrious Larrey, forgetting at the moment that his death, then very recent, had been noticed last year by Dr. Black; but in an address devoted especially to surgery it may, perhaps, be permitted us to record our admiration of his talents, and of his long and untiring devotion to the cause of science and humanity; at any rate I claim for myself the privilege of adding my stone to his cairn.

To his name are now to be added those of several other distinguished members of our profession, who have been lost to us since our last meeting. Among these are Dr. Macartney, of Dublin; Mr. B. Walker, surgeon to St. George's Hospital; Mr. Tyrrell, surgeon to St. Thomas's Hospital, and, to come nearer home, Mr. Baynham, of Birmingham, and Mr. T. Fawdington, of Manchester. These occupied some of the most conspicuous places in the ranks of the profession; but besides these, many others, no doubt, are gone, who, although unknown to fame, may have been honourable and useful members of it, and whose loss may have been deeply deplored by the circle in which they have been accustomed to move. For as no elevation can place us beyond the reach of the shafts of death, so no obscurity can conceal us from his observation, or render us beneath his regard:—

> "Pallida mors æquo pulsat pede pauperum tabernas,
> Regumque turres."

The best wish with which I can take my leave of you to whom I feel so much indebted for your indulgent reception of this very imperfect sketch, is

that his visit to each of you may be long delayed, and that when he does knock at your door you may be prepared, by a well-spent life—a life spent in the faithful discharge of your duties to your God and your fellow creatures—to admit him, an undreaded, if not a welcome guest.

ESSAYS AND CASES.

ARTICLE III.

THE ACTUAL PROCESS OF NUTRITION IN THE LIVING STRUCTURE DEMONSTRATED BY THE MICROSCOPE; AND THE RENEWAL OF THE TISSUES AND THE SECRETIONS FROM THE BLOOD THEREBY ILLUSTRATED.

BY WILLIAM ADDISON, F.L.S.,

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INTRODUCTORY REMARKS.

In arranging the following or second series of "*Experimental Researches*" on the blood and nutrition for publication, it was found that there were still certain points, such, for instance, as the place of origin and the structure of the red corpuscles, with the relation existing between them and the colourless ones, upon which differences of opinion prevail among microscopical observers.

The determination of these questions can have but little or no influence upon the views advocated in this paper. Both the red and the colourless corpuscles or cells circulate in all the capillary blood-

channels of the human body; and the object of the following pages is to trace the several stages through which *the latter* pass in their progress through the tissues, to describe the visible or physical characteristics of their contents, and to investigate the probable result of their final dissolution.

The coagulation of the buffy coat of the blood is a *glaring instance* of an elastic, compact, fibrous, and colourless tissue, resulting from the fibrillation and incorporation of the colourless elements of the blood: the experiment related in the following paper (p. 244) is a *glaring instance* of the actual formation of this tissue, in which we see how the colourless blood corpuscles and the molecules are included in and incorporated with the fibres; and, lastly, the accumulation of the colourless blood corpuscles in the capillary vessels in the web of the frog's foot after immersion in warm water, their adhesion to the walls of the vessels, and their situation first between the red current and the tissue, and then among the fibres of the latter, is a *glaring instance* of the process of nutrition. The views and theories hereafter set forth are deduced from these Baconian *glaring instances.*

In passing from the confines of the visible to those of the invisible domain of matter, we must bear in mind that the latter or the invisible is quite as important as the former or the visible; for all objects become invisible long before we arrive at the end of their composition.

The ultimate atoms or forms of oxygen, nitrogen, carbonic acid, and water, as they surround us, and as we inhale or exhale them, cannot be rendered visible by the most powerful microscope; hence,

therefore, we may conclude that the smallest visible molecule, forming part of an organized structure, is a compound of several atoms. Moreover organisms, at least twenty times smaller than the blood-cells, may be seen by the microscope in decomposing animal infusions, moving rapidly about from place to place, darting to and fro, and exhibiting properties of a peculiar order. These have members, and are composed of several parts; therefore we must prepare ourselves to consider the blood-cells, with reference to living beings below them in the scale of magnitude, as *large and complicated structures*, probably composed of various parts, and containing various products.

"The knowledge of man hitherto," says Bacon, "hath been determined by the view or sight; so that whatsoever is invisible, either in respect of the fineness of the body itself, or the smallness of the parts, or of the subtlety of the motion, is little inquired; and yet these be the things that govern nature principally, and without which you cannot make any true analysis and indication of the proceedings of nature."

The observations hereafter related in detail were made, as before, with a magnifying power of 250 diameters only, and with the light of a bright sky, so that refraction can scarcely be supposed to have had any influence in producing erroneous results. This moderate power has been found sufficient to show the effects of water, dilute acetic acid, and *liquor potassæ* on colourless blood, mucous, and pus cells; to exhibit their compound structure and the molecules and the fibres which result from their

disintegration; to render visible the molecules and fibrous structure of mucus, and of the buffy coat of the blood; and to show the active voluntary movements of the *monadina* and *vibrionia.*

The use of this comparatively low power admits, in the simply constructed microscope I have used, of the application of re-agents to the objects without interfering with the continuance of the observation, and without fear of injury to any brass work of screws and adjustments.

It would be useless to speculate how far the facts contained in these and my former researches accord with the results obtained by other observers; one example, in proof of their general accuracy may however be mentioned, namely, that the disintegrating power of liquor potassæ on the polygastric animalcules was not discovered by accident—it was expected and *looked for,* from the effect previously witnessed from its application to blood, pus, and exudation cells.

To some persons, microscopical, or indeed any other minute anatomical researches, may appear better left in the hands of those who profess to follow only such pursuits, than to occupy the time and attention of others actively engaged in the practical duties of the medical profession; nor should I indeed have taken so large a share in them had I not anticipated results likely to place these practical duties on a somewhat more satisfactory foundation.

Hydropathy and mesmerism on the one hand, and homœopathy and emotional or mind cures on the other, appeared to me to require some more

scientific explanation or answer than that usually returned by those who cultivate medical science. How far I may have succeeded in indicating a more satisfactory foundation for the *rationale* of these cures, and for medical practice generally in a large and important class of diseases, I leave others to judge for themselves, when they shall have been in possession of, *and have read,* the whole of my researches.

If any one should form a different opinion, or question the accuracy of some of the minor points of microscopical details, I cannot say that in correcting any such *supposed* errors I shall be induced to abandon those practical views which are supported by the "*glaring instances*" just mentioned, which give a reasonable explanation to the empirical results of enlightened medical experience, and moreover enable me to satisfy my own mind as to what I have to do, or ought to attempt to do, in the treatment of disease; unless, indeed, having proved *me* to have taken a decidedly wrong course, *they* are able also to support and establish on better grounds a more satisfactory explanation.

The great importance of the *colourless* corpuscles of the blood in the nutrition of the structures of man is already beginning to be fully acknowledged; every new observer of the beautiful process of fibrillation in the liquor sanguinis wonders that *that* had never been studied before; and the *theory of nutrition* developed in the following pages throws a new and a very high interest around that remarkable exhibition of the Divine creative power, which since the discovery of the microscope has excited the wonder and astonishment of thousands.

It is not presumed that the following researches have materially abated the difficulties which surround all physiological investigations; but they have, as it were, shifted the ground of the difficulty, and thereby enabled us to see *why* things, apparently so different as perspiration and exercise, ablution and friction of the surface of the body, counter-irritation, purgatives, and bleeding, *must* all, in different ways, concur in modifying or accelerating the nutritive changes of the tissues, and thereby alter the condition of the blood; and *how* change of air, change of diet, and change in the nature of the liquids received within the body, by varying the nutritive elements presented to the living structures in, or which are to form, the blood, *may* either produce or cure diseases.

Liebig has justly remarked that "the most exact anatomical knowledge of the structure of the tissues cannot teach us their uses; and from the microscopical examination of the most minute reticulations of the vessels we can learn no more of their functions than we have learned concerning vision from counting the surfaces on the eye of the fly."

The most successfully injected anatomical preparations, exquisite and beautiful as they are, can be compared only to deserted houses; we can learn no more of the processes of secretion and nutrition from them than we could of the habits or movements of the inhabitants by wandering through the streets of a deserted city. But if we turn the microscope to the study of other objects—the more perishable elements of the structure—then it is probable that we may, again to use Liebig's words, "arrive at

conclusions calculated to give us a more profound insight into the essence of the vital processes."

The rapidity of the decomposition (of the changes) of the elementary structures of the body is in a direct ratio to their importance in the functions of nutrition, secretion, and life; and all the future advancing steps of physiological and pathological anatomy will be accomplished by those who will carry with them the microscope and the test-tube to the dissecting room, and seize upon the objects which adhere to and leave their stain upon the bright blade of the scalpel.

SECTION I.—ON SECRETION.

Three years ago I published* several cases demonstrating the existence of great numbers of colourless corpuscles in the buffy coat of the blood: they were detected by the aid of a Coddington lens merely; and their nature and characteristics, with their relation to the red corpuscles on the one hand and to the tissues on the other, were at that time quite unknown to me. In two subsequent numbers of the same periodical† I first published the fact of the lymph globules being seen accumulating in the irritated vessels of the frog's foot; and I also *then* stated that a thin film of the coagulated fibrine from the surface of inflammatory blood had all the the structural characteristics and physical properties of fibrous or membranous tissue.‡

* *Medical Gazette,* December, 1840.

† *Ibid.* January and March, 1841.

‡ *Medical Gazette,* vol. i., pp. 477–690; vol. ii., p. 14, 1840 and 1841.

At the period these observations were thus incidentally recorded, the object I had in view was to find out the nature and origin of tubercles in the lungs, and the normal structure of these organs therefore came under my review. The prevalent opinion with regard to the termination of the minute bronchial sub-divisions did not appear to me to be borne out by my dissections; I therefore entered upon a series of experiments, for the purpose of discovering what these terminations really were, and their results formed the subject of a paper, published in the *Philosophical Transactions.** The investigation into the normal structure of the lungs necessarily occupied some months; and at its conclusion I found the facts I had previously published had but very slightly attracted the notice of microscopists.

The memoir on "The Air Cells of the Lungs" was finished in March, 1842; and in the following month† I described the very remarkable process of *fibrillation* in the liquor sanguinis, whereby the tough and elastic membrane or tissue I had before noticed is formed.

This observation appeared to me at that time, when connected with my previous results, to form a "*collective instance*" in Bacon's classification; and I commenced a series of *experimental researches*, with the full expectation of ultimately arriving at a higher induction or generalization, as regards nutrition and secretion, than had hitherto been attained.

* "On the Ultimate Distribution of the Air Passages, and the Formation of the Air Cells of the Lungs."

† *Medical Gazette*, April 15, 1842.

It was not long before I was enabled to devise a method of demonstrating the existence of numerous colourless corpuscles in the blood at all times, however minute the quantity might be; and I always found them more conspicuous and abundant in blood drawn from vessels whose calibre was increased by *inflammation*, or which were administering to an accelerated process of nutrition; hence the investigation, which had been primarily directed to the buffy condition of the blood, and to the origin and nature of a morbid deposit in the lungs, was now by insensible degrees turned into the wider sphere of nutrition, secretion, and disease in general.*

By the application of several re-agents, and by comparing their effects upon the colourless blood corpuscles with those resulting from their application to pus globules, I came to the conclusion that lymph and pus globules, exudation cells, and epithelium, originate from the colourless corpuscles. This conclusion was strengthened by the fact that the fibrine of the liquor sanguinis was never seen during the progress of fibrillation to give origin to a corpuscle or globular particle of any kind. The chief difficulty in establishing this conclusion arises from the doctrine that all the blood vessels have *permanent tubular parieties*. My object on the present occasion is to show the nature of these tubular parieties; the changes they undergo; and to point out how the colourless blood corpuscles are included in their structure.

* *Vide* "Experimental Researches," published in vol. xi. of the *Transactions of the Provincial Medical Association*; and also separately by Mr. Churchill.

That the buffy coat of the blood is neither more nor less than elastic fibrous tissue may be readily verified by breaking down and washing away all the lower coloured portion of the clot. The process by which it is formed, and the numerous molecules and corpuscles included in the interstices of the fibres, may be demonstrated in the following manner:—

Experiment.—Provide six or eight slips of glass, such as are usually employed for mounting microscopical objects, and as many smaller pieces. Having drawn blood from a person with rheumatic fever or any other inflammatory disease, place a drop of the colourless liquor sanguinis before it fibrillates, on each of the large slips of glass; cover one *immediately* with one of the smaller slips, and the others one after another *at intervals of thirty or forty seconds;* then, on examining them by the microscope, *the first* will exhibit colourless blood corpuscles in various conditions, and numerous minute molecules distributed through a more or less copious fibrous network; and *the last* will be a tough, coherent, and very elastic membrane, which cannot be broken to pieces nor resolved into smaller fragments, however roughly or strongly the two pieces of glass be made to rub against each other.* This is a "*glaring instance*" of a compact, tough, elastic, colourless, and fibrous tissue, forming from the colourless elements of the blood, and the several stages of its formation may be actually seen and determined. Numerous corpuscles may be observed in all these preparations to have resolved themselves,

* *Medical Gazette*, March 26, 1841, p. 14.

or to have fallen down into a number of minute molecules, which are spread out over a somewhat larger area than that occupied by the entire corpuscles; and although still retaining a more or less perfectly circular outline, yet refracting the light at their edges in a manner very different from that in which the corpuscles themselves are seen to do. It is from these and various other larger and more irregular masses of molecules or disintegrated corpuscles that the fibrinous filaments shoot out on all sides as from so many centres; or frequently the filaments are more copious in two opposite directions.

It is highly probable that the molecules and the plastic fibrillating liquid are both derived from the interior of the colourless blood corpuscles.

Experiment.—Blood was taken from the back of the hand by a puncture; it was pressed into a thin film, and its appearance under the microscope is delineated in plate 1, fig. 1; the red corpuscles are banded together, the colourless ones, eight in number, preserving their figure and standing alone. A drop of water was added at one of the edges of the upper glass; immediately both the red and the colourless corpuscles changed their aspect: the former broke up and separated from each other, becoming granular and smaller, but not all in the same degree; the latter became larger, with a very bright border surrounding a dark molecular centre. (Plate 1, fig. 2.) In five minutes further changes had ensued; the red corpuscles were very faintly visible, disintegrating and dissolving away, leaving minute filaments and ruptured integuments upon the field;

the colourless corpuscles were very much enlarged by imbibition, the outline of the central portion was no longer visible, and they appeared to be filled with molecules. (Plate 1, fig. 3.) In ten minutes the outer integument of many of the colourless corpuscles had partially given way, molecular matter and filaments appearing outside or on the exterior of the corpuscles. In a quarter of an hour or twenty minutes the corpuscles were evidently surrounded by a copious deposit of molecules and filaments, and had assumed the aspect shown in plate 1, fig. 4. Several other experiments of a similar kind yielded the same result; and when a very dilute solution of the liquor potassæ was added to those few corpuscles which were still entire, they were seen to burst, and several filaments and numerous molecules were evident among their discharged contents.

The fluid in which pus corpuscles are found frequently fibrillates: a fibrous network may almost always be found in the serous fluid of a blister; and lymph globules float in a liquid which forms fibres, as does the liquor sanguinis.

These facts appear to me to lead to the following explanation of the formation of the buffy coat of the blood in all those cases in which its presence is connected with disordered function or disease. In pregnancy, and doubtless in other normal conditions of the body, the blood may exhibit a more or less obvious buffy coat, still in these cases the explanation I am about to offer will apply; for any circumstances increasing the amount of colourless corpuscles in the blood will produce it, but to apply the *rationale* to

disease. From sundry causes the process of nutrition, or what amounts to the same thing, the function of secretion, is disturbed or diminished, and the colourless corpuscles therefore accumulate in the blood. When a vein is opened a greater number than usual flow out; from the sudden change of temperature to which they are exposed, or from other causes, many of them burst or become ruptured, and discharge their contents, consisting of liquor sanguinis and molecules. After standing a short time the liquor sanguinis rises to the surface, drawing up not only the molecules which were associated with it in the interior of the corpuscles, but also all those colourless corpuscles which have preserved their integrity amid the changes to which they have been exposed; here it very shortly fibrillates and forms tissue, as it would have done in the living vessels had the contents of the corpuscles been appropriated to the purposes of nutrition.

Accordingly neither the fibrinous element nor the serum circulate in the blood as part of the fluid in which the red corpuscles are suspended in the living vessels; they are both inclosed within, and form, incorporated together, an essential ingredient of the interior contents of the colourless corpuscle. Hence, therefore, the fibrine can no more be said to be elaborated from the albumen than the stone or kernel of a peach can be said to be elaborated from the fruity pulp—they both grow together; so likewise the fibrinous element and the albuminous element grow or are elaborated from other sources: if they bear a due proportion to each other the corpuscle or cell will be normal, and its subsequent function

will be healthy; but if one element preponderate over the other, the reverse of this must happen. What, then, it may be asked, is the nature of the liquid in which the corpuscles move when in the living vessels? It is impossible to determine; for it cannot be procured for experimental examination without being mingled with corpuscles, nor, according to these views, without some of them bursting and mingling with it their own contents.

There are several remarkable analogies between the liquor sanguinis at the surface of buffy blood and mucus. The former is a plastic fluid, containing numerous molecules and colourless blood corpuscles; and when the fluid fibrillates it incorporates the molecules and unruptured corpuscles, forming tissue. The latter is a glairy semi-fluid tissue, containing numerous molecules and colourless (mucous) globules. Mucus frequently exhibits a copious and distinctly fibrous character or structure, and always does so when a little dilute acid is added to it—an addition which cannot *form* the fibres.

It is probably owing to this peculiar, though sometimes invisible fibrous structure, that mucus is so tenacious and elastic—two remarkable physical properties placing this animal product between the more solid and visibly fibrous structures and the more completely fluid parts of the body.

Experiment. (*Mucus.*)—A transparent drop of glairy mucus from the nose was placed upon a slip of glass; it was lightly pressed into a thin film, and examined by the microscope. Numerous corpuscles

were seen, various in shape and magnitude, and filled with molecules and granules. The mucus, although perfectly transparent, had here and there an evident fibrous structure; and the corpuscles were in many places elongated and lying close together, side by side; many of them had evidently expended themselves, or had contributed their interior fluid contents to form the fibrous tissue-like matter of the mucus, leaving visible nothing more than little elongated masses of molecules, enveloped in and connected together by the almost invisible fibres. On adding a drop of the dilute acetic acid, and mingling it with the mucus, it became whitened, and its fibrous character or structure was rendered very evident; at the same time the mucous globules experienced a remarkable change: their uniform molecular appearance was altered, the interior contents were, with the molecules, drawn up together, forming two or three larger granules, (nuclei, or discs?) leaving the outer transparent integument of the globule of the same dimensions as before the addition of the acid. These results occur with all kinds of mucus.

Experiment. (*Pus.*)—A drop of white and opaque healthy pus was placed on a slip of glass, and well mingled with a drop of liquor potassæ: it entirely lost its opaque character, and became clear and transparent, resembling mucus. The fluid was now exceedingly tenacious, glairy, and elastic; it could be drawn out with the point of a needle into strings or filaments, six or eight inches long. A drop placed between two slips of glass and examined by the microscope was seen filled with molecules

and granules, but there were now no corpuscles remaining entire, they had all of them been ruptured by the alkali. On mingling another drop with a little diluted acetic acid it shrank up, would not mingle with the acid, but resumed somewhat of its former opaque white aspect; and now on submitting it to an examination by the microscope, pressed into a thin film, it exhibited as copious a fibrous structure or character as the fibrillated liquor sanguinis. A drop of partially opaque muco-purulent secretion was treated in the same way, with the same results.

This experiment, which may easily be made, and requires no microscope, except to verify the existence of globules in pus before, and their total absence after the addition of the alkali, sets at rest the question of the difference between pus and mucus; for if opaque pus can be changed into transparent mucus by bursting the pus globules, the inference naturally is, that the transparent parts of mucus and the isolated molecules have the like origin. The experiment, therefore, confirms the identity of mucous and pus globules, and corroborates the conclusion as to the origin of the molecules and the fibrillating liquor sanguinis of buffy blood.

Experiment. (*Liquor Sanguinis.*)—Three or four drops of the liquor sanguinis from buffy blood were placed, before the fibrillation of the fibrine, on a slip of glass. The fluid appeared of a straw or buff colour, and nearly opaque from the multitude of colourless blood corpuscles. It was well mingled with a drop of liquor potassæ, and gradually it became quite clear, transparent, and colourless, in

consequence of the rupture of all the corpuscles by the alkali. The mixed materials were now almost semi-solid, and resembled a glairy mucus.

Experiment. (*Blood.*)—A drop of recent blood was placed on a slip of glass and a drop of liquor potassæ beside it; on bringing the two together and mixing them, the effects were very singular and striking: ultimately, when they are well mixed, there results a transparent, gelatinous, or mucus-like liquid of a brownish tint. The phenomena here are owing to the rupture of the red blood corpuscles by the liquor potassæ, the result being a transparent brownish liquid, resembling, in several respects, ordinary mucus. On subsequently mingling a drop of the diluted acetic acid with these mucus-like liquids, they are rendered opaque, and the opaque portions under the microscope display a more or less evident fibrous arrangement according to the varying circumstances of the experiment.*

There have been many instances during the progress of these researches, in which I have stated that the colourless blood corpuscles imbibe water and increase considerably in size, the outline of the central portion disappearing, the corpuscles assuming a globular figure filled with molecules. The

* These experiments may be varied thus:—Place in a four-ounce phial a quantity of muco-purulent fluid or pus, so as to about one-third fill it; then add a like quantity of liquor potassæ, and shake them well for some minutes. The mucus or pus becomes nearly or quite transparent, by rupture of the corpuscles; then, before the froth at the top has all gone off, fill the phial with dilute acetic acid, pouring it in gently, so that it shall swim at the top, when the opaque white fibrous tissue-like matter may be seen copiously by the eye alone.

following experiment demonstrates their extreme susceptibility to the influence of acids and alkalis :—

EXPERIMENT.—Having added to an ounce of pure water two or three drops of dilute acetic acid, and to another ounce of water two or three drops of Brandish's liquor potassæ, I found that neither the acid nor the alkaline solution had any taste; it was impossible to distinguish in this way between the one and the other, or between either of them and pure water; litmus paper wasbarely perceptibly reddened by the acid, and turmeric paper gave but slight indication of the alkali. I then took twelve ounces of blood from a patient suffering from dropsy after scarlet fever; and having placed a drop of the colourless layer of the liquor sanguinis before fibrillation on a slip of glass, I added to it a drop of water, mixing them well together; the corpuscles enlarged gradually to three times or more their former size, and were filled with molecules or granules. In a quarter of an hour they were as large as, and could not be distinguished from mucous globules. I now mingled with these altered corpuscles a drop of the weak acid solution, and in a few seconds *I saw* the central matter or the interior of the corpuscles *collapse* and separate from the outer transparent integument, appearing in its interior in a variety of forms, sometimes as a single one, or as two or three oval or circular shaped objects (discs?) or as a circle composed of three, four, or more bright granules. Sometimes the outer transparent integument, which remains of the same dimensions as prior to the application of the acid, is so faintly perceptible that

it requires close attention to perceive it. This alteration is precisely the same as that which takes place in mucous and in pus globules from the same re-agent. I then took another drop of the liquor sanguinis, and first placing it in focus under the microscope, I added to it a drop of the weak alkaline solution; the first effect of this application was to cause the corpuscles to alter their appearance, and to enlarge in the same manner as if water only had been added; but in the course of a very short time, I observed them one after another explode with considerable force, discharging a quantity of molecular matter mingled with some filaments, and a multitude of molecules and granules, the fluid resulting from their disintegration being glairy and tenacious like mucus. The changes and alterations I witnessed are delineated in plate 1, fig. 6.

(*a.*) The colourless blood corpuscles.
(*b.*) The same objects after the addition of the water, and resembling mucous globules.
(*c.*) Their appearance on adding the weak acid solution after the water, and resembling pus globules.
(*d.*) The effect of the alkaline solution after the corpuscles had passed through the stage (*b*), the resulting fluid resembling mucus.*

It is evident from this experiment that the colourless corpuscles of the blood are immediately altered by the acid or alkaline quality of the fluids with

* Some of these results have long been published, *vide Medical Gazette*, April 15, 1842, p. 148, but I did not at that time know how best to show and explain them.

which they become associated; and there can be little doubt that the vital properties and chemical arrangement of the particles of matter within the corpuscles must be modified by the nature (the chemical nature) of the fluids they imbibe, otherwise there would be no alteration in their visible appearances; and hence, when they discharge their contents, these will have different qualities, according to the circumstances in which the corpuscles have been placed. These results appear to me to have some, though as yet perhaps an obscure, relation with the phenomena and treatment of two very distinct and opposite classes of disease, in one of which acids and all things tending to produce acidity in the body are scrupulously avoided, and in the other they are very urgently required and liberally allowed.

From the various appearances presented by pus corpuscles, I conclude that they are frequently subjected to similar influences; the fluid in which they exist sometimes becoming slightly acidulous, either from chemical change, or from having been originally of this nature, so that all the unruptured corpuscles assume the aspect shown in plate 1, fig. 6, *c*; but if the fluid be ever so slightly alkaline, they are seen in a more disintegrated state, mingled with a far larger number of minute isolated molecules, and with the outer integument extremely attenuated, very much resembling in appearance, except colour, the bile vesicles from the liver.

These remarks and observations show that it is necessary to attend to the qualities of the fluid used to separate pus globules from each other for

microscopical purposes, or for the examination of the changes in blood corpuscles; if it be pure water there is a series of alterations and changes due to it; if there is the slightest degree of acidity present there will be a different series of appearances; and if, again, there be any alkalinity, the corpuscles will be found undergoing totally different changes from that source. From these experiments I draw the following conclusions:—

1st. That the plastic fibrillating liquid, denominated liquor sanguinis, exists as a fluid within the colourless blood corpuscles, and that when it escapes from them it forms an elastic fibrous tissue, the serum being the residual liquid.

2nd. That mucous and pus globules are altered colourless blood corpuscles, and that the glairy fluid termed mucus is nothing more than an altered state of the fibrillating liquor sanguinis, the change from the one to the other being co-eval with the changes which characterize the microscopical aspect of the corpuscles. Hence, if we take the red portion of the buffy clot, and the red blood corpuscle, to represent blood, then the colourless layer of liquor sanguinis with the colourless blood corpuscle will represent the first remove from blood, and mucus or pus, with the mucous or pus globule, will be the next. And it would appear generally, that the nearer the corpuscle is to, or the fewer the stages of its removal from the circulating fluid, the more nearly it resembles the colourless blood corpuscle, and the more decidedly and visibly its fluid contents, when they escape, fibrillate; whereas the further the corpuscle is, or the greater the number

of stages of its removal from the circulation, the larger it is, the more it is filled with molecules, and the less perfectly do the fluid contents fibrillate. Now, if it be admitted, of which I have myself no doubt, that the fibrillating liquor sanguinis is changed into mucus in the interior of living cells, then there can be no difficulty in admitting that similar living cells, by a different mode of elaboration, may form not only sundry kinds of fibrous or mucous tissue, but the tears, saliva, milk, or bile.

Experiment.—A woman applied for relief from pain and irritation in the eye, brought on by a drop of hot water which had accidentally got into it: there was very little injury done; the conjunctiva was red, and there was considerable lachrymation. I took a perfectly transparent tear from the corner of the eye, and spreading it out a little I examined it, without any covering, by the microscope, and found great numbers of colourless corpuscles, varying in figure; they appeared shrivelled. (Plate 2, fig. 3, *a*.)* I added a drop of pure water, and stirred them well together. In two minutes they presented the appearance shown in plate 2, fig. 3, *b*, and resembled exactly colourless blood corpuscles treated in the same manner. In five minutes I found that several had burst and had emitted molecular matter, the half-emptied integuments still containing molecules and bright granules; others had increased more in magnitude; molecules and granules were variously distributed within them, and in some of them there was a collapsed interior

* Also plate 2, fig. 20, in the first series of these "Researches;" *Transactions of the Provincial Medical and Surgical Association*, vol. xi.

portion, having all the characteristics of that body which has been denominated the nucleus of a cell.* (Plate 2, fig. 3, *c.*) After the lapse of fifteen or twenty minutes, further alterations had taken place: there were several corpuscles which had preserved their integrity, displaying a highly complicated structure, and in most of them there was the same collapsed and more or less divided central matter. In close contact and connected with these corpuscles on their outside, there were numerous molecules and a molecular base, which had evidently been emitted from their interior. (Plate 2, fig. 3, *d.*) I now added to these corpuscles a drop of dilute alkali, and the bursting open of their integument, the singular contortions it underwent, and the discharge of the molecules and granules, were very remarkable. (Plate 2, fig. 3, *e.*) Now these highly organized vesicles or cells are not likely to be mere exudation corpuscles, according to the definition and mode of origin usually assigned to these objects; on the contrary, it is much more probable that they were *tear-vesicles*, hurried through the stages of their growth or development by an abnormal nutrition—colourless blood corpuscles, in fact, in the primary stage of their special existence.

Experiment.—A child four years old, in perfect health, began to cry. I collected and examined a tear by the microscope, and the objects seen in it are delineated in plate 2, fig. 3, *f.* They are evidently epithelial scales, (the collapsed and empty integuments of epithelial cells,) except the oval object at the top of the group on the left hand, which

* *Vide* the experiment, p. 245, *ante.*

appeared as I have sketched it, tense and full. Now the question is, whether these collapsed epithelial tunics belong to the mucous epithelium of the lids and eye-ball, or whether they originate from the tissue which, from the analogy of all other secretions, may be presumed to give origin to the tear-cell. Attached to most of these, as indeed to all perfect epithelial scales, there was a little kernel or nucleus, which is shown in some of the figures; but as the term nucleus has been indiscriminately applied to the altering particles of blood and other corpuscles, as well as to these permanent and fixed objects attached to the integument of epithelial cells, I have forborne the use of the term in these researches.

When making the experiment described in my former researches,* with blood taken from the skin of a patient with scarlet fever, two, three, or four colourless corpuscles may usually be seen in several places in the field of the microscope in close contact with each other; and when they are put in motion there is evidently some structural union between them; for although they still retain their figure, they all move together and do not separate from one another. Pus globules generally adhere together, forming a species of friable tissue; they can rarely be satisfactorily examined by the microscope without being well stirred previously with a little water or serum, to disentangle them from each other; and as I have seen them, they have had, as frequently as the contrary, filaments

* *Transactions of the Provincial Medical and Surgical Association*, vol. xi. p. 237.

and molecular matter attached to their irregular external integument, and rendered very obvious when the globules were put in motion by touching the upper piece of glass. Moreover I am, I believe, constantly seeing cells forming transitions from red to colourless corpuscles, from colourless corpuscles to pus and mucous globules, and from pus globules to tissue and epithelium, in the purulent and lymph discharges from cuts, sores, and fungous excrescences on the hands or fingers. Now definitions are all very well in their proper place, very necessary, and highly useful ; but they have always tended to obstruct rather than facilitate minute investigations. There are no visible or sensible broad lines in nature, and therefore all definitions must necessarily fall short of what they are intended to accomplish if too strictly applied. The more accurately and minutely we scrutinize the physical and vital phenomena so profusely scattered before us, the more difficulty we find in framing or using definitions, unless in a large, comprehensive, and liberal sense. We may readily frame a definition that shall distinguish a tree from an elephant or a man, and yet we cannot frame one to distinguish the vegetable from the animal scale of creation ; so likewise we may see a great difference between a red blood corpuscle and an epithelial cell, and yet a very little investigation will discover to us objects forming a connected series between them.

Finally, then, these investigations have confirmed the conclusions which were drawn from my previous "Researches," that the colourless corpuscles of the

blood are very highly-organized cells, within which the special tissues and the secretions are elaborated; and it appears that the renovation of these tissues and secretions from the blood does not take place by the cells discharging their contents into the general mass of the circulating current, to be separated therefrom by some peculiar transcendental and purely hypothetical selective process of exudation, through a structureless and transparent tissue, but by being themselves attached to, incorporated with, and performing their special function in the structure.

The facts upon which the above conclusions are grounded, render it to my mind not only very probable, but certain, that the progress of the colourless blood-cells in administering to the maintenance of the living body is not, as I should term it, *back again* into red corpuscles, but *onward* into the higher forms of organized fibrous tissue and epithelium. This view of their nature and destination makes it exceedingly doubtful whether the molecules and granules seen in the liquor sanguinis and in the interior of the colourless blood-cells, be really "young cells," as is supposed by Dr. Barry; and these doubts were indicated in the "Researches" before referred to.*

It now appears to me that the blood-cells have their origin in the chyle, and that every step, by which they multiply or increase in numbers, is progressive, carrying them higher in the scale of organization, until at length they acquire colour by passing through the capillary vessels of the lungs; they then again become colourless by

* *Loc. cit.*, pp. 261, 265, 273, &c.

further elaboration or nutritive changes, and in this condition are prepared to enter upon what may appropriately be termed a higher and more special state of existence, *i. e.*, into the composition of the tissues.

To suppose the molecules in the interior of the colourless blood corpuscles to be objects destined for the reproduction of blood-cells, would be, I think, to admit of their descending in the scale of organization; whereas, according to the view I take, there is a gradual rise and progression, without the slightest break or interruption, from the primary colourless cells in the intestinal villus, through sundry generations, up to the red blood-cells; and from these again to the more complexly organized colourless blood-cells, which form the foundations of the tissues and the special secreting cells—the link between the blood and the more solid structures, the unity from which the pluralities arise. If, therefore, the colourless blood corpuscles be termed "parent cells," they must be considered as pregnant with the embryo materials of the tissues and secretions, and not with "young blood-cells." According to this view of the entire dependence of secretion upon the nutritive process, neither milk, mucus, nor the bile, are derived from the blood as such; on the contrary, they are each elaborated in the interior of cells which were previously colourless blood cells, *the change from a blood to an epithelial cell being the sum of the process of secretion; and milk, mucus, and bile, are the visible fluid results of the final dissolution of the cells.* Hence, therefore, a secretion is the result of the last stage of the process

of nutrition; and hence, also, it is by the special vital activity of individual cells, and of all the visible particles composing their structure, that the secretions are produced, just as in the party-coloured petal we may see a yellow or a pink cell, not only contiguous to, but in close contact and structurally connected with a blue, a purple, or a white one. The conclusion therefore is, that the molecules in the interior of the colourless blood cells are analogous to those in the interior of the coloured cells of the petal, and to those so remarkably conspicuous in the interior of the cells of the leaf of the *Sedum acre*, or of any other leaf, which have never been considered as reproductive. They are active vital objects essential to the peculiar contents of the various cells. These opinions are borne out, not only by the countless myriads of molecules in pus, in the hepatic and in all other epithelial cells, but also throughout every part of the structure of all organized beings. These molecules have never been supposed to be reproductive objects, yet the argument is as strong in their favour as it is for the reproductive function of the molecules of the colourless blood cells.*

Again, the experimental results before related, where, upon the addition of dilute acetic acid to the colourless blood corpuscles *after* water, the interior contents of the corpuscles were seen to corrugate or coagulate and to be drawn up more closely together, seem to require a few further remarks. Dr. Barry, in his "Memoirs on the Cor-

* *Vide* "Experimental Researches," *loc. cit.*, pp. 263–4, &c.; plate 3 and 4, figs. 28 to 35.

puscles of the Blood,"* does not make any very clear or decided distinction between the red and the colourless corpuscles; and he constantly refers to the use of the dilute acetic acid, speaking of it as requisite to remove the colouring matter, and thus enabling the observer to perceive the objects which he calls "discs." In a subsequent paper he recognises in the colourless blood corpuscles his "parent cells."† Now, according to my experiments, these "discs" have no existence in the colourless corpuscles, *as such*, until the addition of the acid; they cannot be seen in the corpuscles in their natural state, nor are they perceptible in them when enlarged by the imbibition of pure water; but the slightest possible degree of acidity in the water, whether intentionally or accidentally present, will produce the "discs," which, according to the results of my experiments, are formed by the corrugation or contraction of that interior matter of the corpuscles which before the presence of the acid appeared filled with minuter molecules. Hence, therefore, from the result of this experiment alone, I should have been led to doubt the *parental function* which Dr. Barry assigns to the colourless corpuscles of the blood.

SECTION II.—ON NUTRITION.

It is impossible to frame any conception of the process of nutrition in the higher orders of the animal kingdom that shall harmonize with the results of recent observations, and at the same time

* *Philosophical Transactions*, 1841–2.

† "On Fibre," in the *Philosophical Transactions*, 1843.

leave undisputed the received doctrine that the capillary blood vessels have permanent tubular coats; without in fact supposing that the walls of these *channels*, in those places at least where nutrition is actually going on, partake in a more or less rapid alteration. The facts contained in these "Researches," with others which have for some time been accumulating from other sources, are quite incompatible with the doctrine that all the blood vessels have *permanent tubular coats*. The appearances seen in the irritated vessels of the web of a frog's foot, the well-known adhesion of the colourless blood corpuscles to their walls, and the situation of these corpuscles among the fibres composing them; the mixture of fibres and corpuscles in the walls of the vessels in the transparent membranes of the embryo (plate I, fig. 5*); and, lastly, the fibrous structure of the buffy coat of the blood and mucus, with the numerous molecules and corpuscles which they contain, negative this doctrine, and lead to the following explanation and *theory of the process of nutrition*:—

Nutrition may be normal or abnormal.

In normal nutrition the colourless blood corpuscles adhere to the tissue forming the boundary of the blood channels; they pass into and contribute to form the tissue, *i. e.*, the parietes of the capillaries, and are afterwards evolved or thrown off from the nearest free surface—a follicle, crypt, or duct, constituting epithelial cells; the mucus, or the secretion given out by the follicles or flowing through

* *Vide* also *Gerber's General Anatomy*, plate 20, fig. 103.

the ducts, being the result of the final dissolution of the cells and tissues. (Plate 2, fig. 1.)

In abnormal nutrition the colourless blood corpuscles adhere to the parietes of the capillaries in much greater abundance; they pass out among the fibres of the tissue, which is now much less fibrous and coherent, and are subsequently thrown off from the nearest free surface—a pyogenic surface, as lymph, pus, exudation, or imperfect epithelial cells. (Plate 2, fig. 2.)

According to this statement of the process of nutrition, the fibrous walls of the capillary vessels are formed by the fibrillation of the liquor sanguinis contained in the interior of the colourless blood corpuscles, some of the corpuscles being employed or expended in forming the fibrous tissue, others passing through it in the interstices of the fibres for further elaboration into epithelium. If the corpuscles congregate in unusual numbers, and be hurried through the stages of their growth by an abnormal nutrition, they come under observation as lymph, pus, or exudation cells; the various appearances presented by these objects, and the quality of their contents, being referrible to the period of their growth, to the special function of the tissue, and to the chemical action of the fluids with which they are associated.* Hence the buffy coat of the blood has a relation to the lower coloured portion of the clot, analogous to that which the parietes of the capillary vessels have to the blood passing through them; and the gradual

* *Vide ante*, p. 245.

contraction of the fibrinous fibres in the former, whereby it consolidates and diminishes in size for hours, indicates very sufficiently in how short a period the latter may have their walls consolidated, forming a more compact tissue after death.

I have called the preceding statement of the process of nutrition "a theory," because it involves some *hypothetical* considerations; and as all medical or physiological theories are justly viewed with great doubt and suspicion, it will be advisable to recapitulate the facts, in order to show how far the demonstration goes, and how much is left for the hypothesis to fill up. The *facts* are these:—

1st. Great multitudes of colourless corpuscles are at all times circulating in the blood;* they are particularly abundant in vessels actively engaged in nutrition;† they are seen attaching themselves to the inside of the vessels in the web of the frog's foot, and their number is very much increased when the tissue has been irritated;‡ they contain in their interior a number of minute molecules, and a peculiar plastic fluid, which fibrillates or forms fibres.§

2nd. Colourless corpuscles and little masses of detached molecules are found incorporated among the fibres in all growing membranes;‖ in the fibrous walls of the blood vessels;* in the buffy coat of the blood;† and in mucus.‡

* "Experimental Researches," *loc. cit.*, p. 237.

† *Loc. cit.*, page 260.

‡ "Experimental Researches," *loc. cit.*, p. 257, &c., plate 3, fig. 27.

§ Page 247, &c., *ante*.

‖ Plate 1, fig. 5, *ante*.

* Plate 3, fig. 27, *loc. cit.*; and plate 1, fig. 5, *ante*.

† Page 244, &c., *ante*.

‡ Page 248, &c., *ante*.

3rd. There is a gradual transition between the colourless blood corpuscles in the interior of the blood vessels; and the lymph and pus globules, the exudation and epithelial cells on their exterior.*

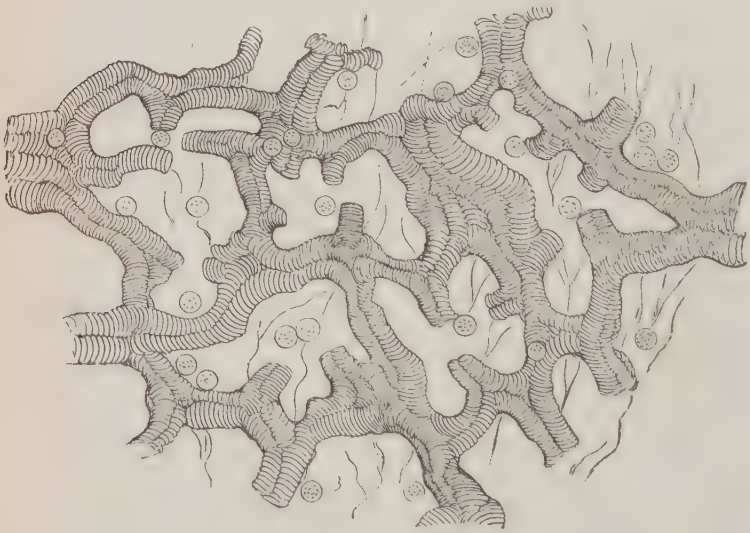
The *hypotheses* necessary to complete the theory are—that some of the colourless blood corpuscles adhering to the walls of the minute vessels form these walls by the fibrillation of their fluid contents; that others are included in the interstices of the altering tissue, pass bodily through it and grow into epithelium; and, lastly, that if the nutrition be hurried or abnormal, they form pus and exudation cells. Meanwhile we are compelled to resort to some form of hypothesis, because the actual growth of the objects and their movements through the tissue cannot be seen.

In my experiments on the web of the frog's foot I have generally used water at the temperatures of 95°, 100°, 105°, and 110°, allowing the web to remain immersed from *thirty seconds* at the higher to *two or three minutes* at the lower temperatures; and I have generally observed among the multitude of the colourless corpuscles adhering to the walls of the capillaries, that some, when urged by the current of the red corpuscles, have been drawn out into a flask-like form, and, sliding for some distance along the boundary of the channel, have been drawn again into the circulation, leaving *something* behind them which has thus become a part of the tissue. I have also almost invariably noticed, when the higher temperatures have been applied, that the red corpuscles adhere to the tissue as well as the colourless ones; and this, in my opinion, is one of the charac-

* "Experimental Researches," *loc. cit.*

teristics distinguishing the normal nutritive process, or an accelerated nutrition, from inflammation.

I have in the former series of these "Researches" remarked that the red blood-cells have a peculiar and very characteristic disposition to cohere, and to lose their figure by the slightest lateral pressure, but that the colourless ones have no such disposition to cohere; they stand alone and preserve their circular form against pressure. Hence we may readily estimate the relative numbers of the firm colourless corpuscles; they are generally seen in the spaces between, and along the margins of the lines formed by the cohering red cells, as shown in the subjoined figure, which represents the appearance of a drop of blood drawn from a pimple on the skin.



In blood drawn from any inflamed surface, or taken from the skin of a patient in scarlet fever, these firm colourless cells are equally numerous and conspicuous.

Now it may be necessary, since the colourless corpuscles are supposed to be such important agents in the nutrition of the structures, and in the elaboration of the secretions, to offer some explanation why, in this experiment, they are not seen in greater numbers, in a proportion more nearly equalling that of the red corpuscles.

This is, I think, accounted for by their strong disposition to adhere to the tissue, so that they are not disposed to flow out when a puncture is made; whereas the red-cells, from the readiness and rapidity of their motion, flow out immediately, and in preference. Hence, the number of colourless corpuscles seen is no valid criterion whereby to judge of their actual amount, though an increase of this amount may be indicated by the greater numbers observed in blood drawn from one spot over that drawn from another situation. That this is not altogether supposition appears from this: I have frequently seen thousands of colourless blood corpuscles adhering to the walls of the vessels, capillaries, veins, and arteries in the frog's foot, after immersion in warm water; and yet, when a puncture was made for the purpose of obtaining these corpuscles, their amount, relatively to the red-cells, has not been at all greater than is shown in the above figure.

But it may be urged, as an objection to the theory of nutrition, that as we *can see* the colourless corpuscles in the irritated web of a frog's foot adhering to the tissue, why *do we not see* them passing through it and forming fibres or epithelium? To this I answer, that the nutritive changes or pro-

cesses are too slow in this example for us to follow, from beginning to end, all the actual stages of nutrition; the corpuscles go on congregating in the irritated tissue for an hour or two. Nevertheless the epithelium of the web and the walls of the capillaries have their visible characters gradually changed during the observation; and numerous corpuscles, more or less altered in shape, may be seen mingled with or buried in the fibrous tissue. This is as far, perhaps, as we are able to go in *seeing* the process of nutrition; and yet if the part were patiently watched for a sufficient length of time, it is very possible that still more of the process might be seen. Moreover, that the great accumulation of the lymph globules or colourless blood corpuscles in the capillary channels of the web of the frog's foot after immersion in warm water, their adhesion to and incorporation with the tissue, is a "glaring instance" of an acceleration of the normal process of nutrition, is, in my opinion, substantiated by the fact, that in the course of a day or two after the application of the warm water, the cuticle or epithelium of the web, composed of pentagonal or hexagonal cells, with their well-known nucleus in the centre, looking like a lymph globule, peels off in large flakes, an event perfectly according with the theory, as it would not have happened so speedily except from the application of the irritant.

The truth of the theory may be tested by the phenomena of any well-marked specific disease—scarlet fever, gout, or rheumatism. Let us take for an example scarlet fever: this disease has a specific character, probably arising from a peculiar poison

imbibed by or affecting the blood corpuscles; whether so or not, at all events, the function of nutrition is more or less obviously disturbed, the secretions are diminished or disordered, and the colourless blood-cells consequently accumulated in the circulating fluid. In the milder and favourable cases of the disease, these cells are specially determined to the epithelial surfaces of the skin, for the purpose of being eliminated from the body, forming an excess or an additional layer of epithelium, which peels off at the termination of the disease. In the severer and more formidable cases, they congregate in the vessels of some one or more of the internal epithelial surfaces, causing muco-purulent discharges, or the formation of abscess, so that a person may have the disease termed scarlet fever without any redness of the skin. If there has been no exfoliation of the cuticle nor any critical discharge, we may conclude that the abnormal corpuscles have not been at all, or only partially and imperfectly eliminated. The patient, under these circumstances, may perhaps for a little while appear to be getting well; but these appearances ought not to be trusted, for the diseased corpuscles are still present in the circulation, insidiously perhaps, by an abnormal nutrition, locating themselves in some of the internal glandular structures, laying the foundation of future scrofulous disease, or forming tubercles in the lungs. If none of these events are taking place, their presence will probably be speedily proclaimed by symptoms of dropsy or of an acute inflammatory or greatly accelerated and abnormal nutrition in the kidneys,

the phenomena of which exemplify the truth of the theory; for the disintegrated tissues and the red corpuscles of the blood are voided in the urine.

These views of the phenomena which frequently mark the course of scarlet fever explain why it happens that those cases presenting the mildest primary type are so frequently followed with the graver lesions afterwards. It also points out the necessity of scrupulously attending to the exfoliation of the cuticle, or watching for some other more or less obvious critical discharge, before we finally dismiss, as cured, a case of scarlet fever, or pronounce it to have terminated satisfactorily. But to try the theory by another test: what are the remedial measures it suggests, where the natural cure—the elimination of the abnormal corpuscles—has been interrupted or impeded?

1st. Bleeding, for the purpose of diminishing the total amount of the colourless blood corpuscles; and by lessening the volume of the blood, to recall, if possible, into the current of the circulation some, at least, of those which have become stationary, oppressing and loading the tissues.

2nd. A more or less active purgation or accelerated nutrition upon all the available epithelial surfaces, so that by speedily removing the worn-out or unhealthy epithelium, a stimulus may be given or space afforded for the more rapid growth of the new.

It is not to be concluded that I am advocating the operation of bleeding in all or even in the majority of those cases, either of scarlet fever or any other specific disease in which the surface of the blood assumes the colourless aspect; I merely

adduce the particular example of dropsy or inflammation of the kidneys, after or during scarlet fever, to show that the theory or *rationale* of the process of nutrition, here set forth, suggests the employment of those remedial measures which enlightened medical experience has approved as very frequently essential to the cure of the disease. But the theory does more: it indicates *two very different modes of withdrawing blood*—one by the lancet, leeches, &c., where both the red and the colourless corpuscles are discharged; the other, by establishing an accelerated nutrition—an eruption on the skin, a blister, an issue, or a seton—where the colourless corpuscles only are selected and thrown off. Thus, then, the judicious employment of bleeding and purgation is the nearest approach to natural cures; for a critical abscess has often put a period to a long and tedious illness, and a critical hæmorrhage has as frequently saved a valuable life.

Moreover, the great and admitted principles of medical practice, slowly accumulated by experience, are illustrated and explained by the theory. The various modes in which these principles can best be carried out must ever depend upon the temperature of the climate, the social habits, the diet, the moral condition, and the education of the people. That pure air, early rising and exercise, abstraction from mental anxiety, and a more rational routine of diet and sleep, are at this moment, and in this country particularly, essential elements of the cure of numerous chronic diseases, is exceedingly evident and clear; the disorders produced by intemperance, indulgence, and indolence, will be cured by

sobriety, frugality, and exercise, in the way that sleep cures fatigue; bread, hunger; and water, thirst. But the most scrupulous attention to the apportionment of the vital stimuli, heat and cold, food and water, air and exercise, has never hitherto prevented or eradicated all human maladies; nor can it shield the body from the influence of the noxious miasmata of the atmosphere, from which a numerous and important class of diseases arise. Hence, therefore, upon these grounds, the proposal of a water, a diet, an exercise, or indeed of any other exclusive mode of cure, applicable alike to all kinds and every variety of disease, is contrary to the order of nature, opposed to all past experience, and must be erroneous. Their doctrines cannot be otherwise than partial and deficient, and the practice to which they lead either useless and unnecessary, or inefficient, and therefore dangerous.

The preceding theory of nutrition may be applied in explanation of sundry other phenomena of disease.

The visible appearances in the web of the frog's foot after the immersion in water, at 96° or 100° F., is of the nature of a *vera causa,* explaining how the calibre of the capillary blood channels may be diminished or enlarged in diameter in brief periods of time, without calling in aid any hypothesis of active dilatation, spasm, or contraction; for the area of the channels, and the physical character of their walls, will depend upon the number of colourless corpuscles stationary upon them, or upon the quantity of tissue left behind by those which slide along them. These visible appearances

are also a *vera causa*, indicating how the parietes of a whole series of capillaries may, during the progress of an accelerated or abnormal process of nutrition, be changed from *fibrous* into *friable* tissue; and how a firm, hard, and vascular tumor is converted into pus; they are also a *vera causa* accounting for the occurrence of spontaneous hæmorrhages. Finally, *in the accelerated nutritive process visible in the web of a frog's foot*, we not only see numerous colourless blood corpuscles adhering to the walls of the vessels, *but we likewise see* that a great many of them, after adhering for some time, are driven again into the circulating current. Now the occurrence of vicarious secretions, the phenomena of *metastasis*, and the different hues or tones of colour presented by the buffy coat of the blood and the serum in different kinds of disease, the variations in the chemical elements of the blood, and several other phenomena, *required such a fact as this for their solution.* For, if the colourless blood corpuscles, being brought into contact with a particular tissue, and adhering thereto, have peculiar changes thereby determined in them, it becomes a question of time only how soon these peculiar changes commence. Reasoning from the facts, we may conclude that a temporary adhesion to the tissue of one organ is sufficient to unfit them for their normal function in another; so that when they are dislodged from their situation and driven again into the current, they carry the changes commenced in one structure into another.

While these sheets were in progress through the

press I received a communication, of which the following is an extract, from Dr. W. B. Carpenter—a name too familiar to the microscopical physiologist to require from me any comment:—" A few months ago I happened to meet with an aquatic larva, of a species I had never seen before, though I think it must have been a *Culex*, in which the circulating fluid seemed to occupy nearly the whole space between the external envelope, and the walls of the intestinal canal. A large number of colourless cells were floating in the fluid, in all respects analogous to the colourless corpuscles of human blood. On each side of the channel through which the fluid was moving, were several layers of cells, exactly resembling those which were floating in it. The layers next the fluid seemed quite loose, some of the cells being every now and then detached and carried on with the current, whilst others were drawn out of this and became adherent; but the layers nearer the parietes of the channel were evidently more fixed, and seemed undergoing alterations, by which they gradually became *fused*, as it were, into the surrounding tissue."*

Case.—On examining the body of a patient who died of the sequelæ of scarlet fever, I found a sero-purulent fluid in the cavities of the chest; hypertrophy of the heart, with fibrinous filaments and shreds adhering to its external surface; and a thick layer of sundry forms of pus globules spread over the pleura costalis. The liver was harder and whiter than usual. The lungs were crepitant and *appeared* healthy; but on cutting

* Dated Bristol, December 1st, 1843.

into them a yellow serous fluid flowed from the incisions; every section swam buoyantly in water; still the minute tissue was evidently loaded with an abnormal deposit. My attention was arrested by the *yellow* fluid; I therefore took away two or three sections and a small portion of the liver; they were carefully kept apart. On subsequently examining, by the microscope, a little of the yellow fluid taken from the interior of *a fresh incision* into one of the pieces of lung, I was surprised to find it full of large granulated cells, of a very yellow colour, having molecules in them, and not distinguishable, by the most careful comparison, from those subsequently procured from a section of the liver; I studiously avoided every source of error. Large granulated vesicles, or cells, are always found in the minute tissue of the lungs; but this is the first, and as yet the only instance, in which I have found in these organs cells resembling the bile cells of the liver.

It may be said that objects as large as these could not pass through the capillary blood channels; but it must be borne in mind that, according to the theory of the process of nutrition, the parietes of these channels are subject to various and rapid changes, resulting from an alteration or acceleration of the nutritive function. It is likewise extremely probable that cells increase in magnitude after the death of the individual. Reasoning therefore from this fact, which perfectly accords with others mentioned in these researches, and assuming that colourless blood cells, contaminated by a temporary adhesion to the tissue of one organ, may again enter the current of the circulation and find

their way to another, we have a *vera causa* for the sudden origin of grave symptoms during an illness, and for the universally popular belief, which, during the long reign of an exclusive solidism in the medical world, has steadily maintained its ground, of the danger attendant upon the sudden suppression of any naturally established excretion.

Case.—A young man, residing in a family of the utmost respectability, of a full habit, living well, and taking very little exercise, applied for relief from several pimples and irritable inflamed boils about the chin and face. I punctured one of the most perfect and recent of the little purulent heads, and squeezed out a little pus. Having added a drop of water I examined it by the microscope, and was surprized at the large size of the cells and the unusually energetic motion of the numerous minute molecules distributed over the field. I also saw in the interior of some of the cells, molecules and granules performing motions as vivid as those I have seen in objects from other structures; nor should I have entertained the slightest doubt of their nature had they been procured from a different situation.

Case.—A man applied for relief from shingles. I punctured one of the *blue*-looking vesicles, and found in the transparent fluid discharged numerous corpuscles, resembling both the red and the colourless corpuscles of the blood; on adding to them a little water they increased very considerably in size; and afterwards, on adding a little liquor potassæ, I saw them burst open and discharge an immense quantity of molecules, which exhibited very vivid

and considerable motions, after passing out of the corpuscles. These results may be compared with those related in the former series of researches.*

In bringing to a conclusion what may be called a *microscopical theory of the process of nutrition,* I shall make a few remarks upon what might otherwise appear to many persons the *rival* explanations of chemistry. There appears to me to be no obstacle to prevent chemical and microscopical observations illustrating each other; on the contrary, either must be imperfect without constant reference to the other.

The chemist may analyze the secretions which are discharged under given circumstances of disease; he may discover a remarkable diminution or increase in some particular ingredient or element; and then he may advise an alteration in the diet of the patient, recommending those articles of food or drink calculated to supply the observed deficiency or remove the redundancy. But do the results answer the expectation? If not, why? Here the microscopical observer steps in and explains the difficulty, even if he does not *a priori* strongly urge the necessity of the greatest caution in admitting the validity of a practice based exclusively on chemical results. He is able to show that the nutritive elements which disappear, including the oxygen imbibed during respiration, are taken within, or consumed by, myriads of living cells; that these cells have a governing or controlling power over the nutritive changes; and that a secretion is the result (the excretion) of their cell-life. It therefore by no means follows, as a matter of course, when *their*

* *Loc. cit.,* pp. 248, 250, 267, and 276.

function is disturbed and the secretion consequently altered, that the one can be restored and the other brought back to a normal standard by offering them an abundance of the principles or ingredients which a chemical examination of the secretions may show to be deficient. The mere chemical practitioner may, indeed, bring his proposed remedies to the living structures, but it does not follow that they will or can partake of the repast he offers. *There is a prior and a higher link in the complicated chain* (extraneous to his investigation) *which must be first adjusted*

SECTION III.—ON THE FUNCTION OF STRUCTURE.

In the two preceding sections I have endeavoured to trace and follow through their several stages the primary and, to the unassisted eye, invisible vitalized forms by which the nutrition of the body is effected, and the various secretions are produced. To the superficial observer the results may appear to furnish but very indifferent data from which to reason out the phenomena of structural vitality. This, however, is far from being the case; and it remains in the following pages to point out those analogies and facts most calculated to give an insight into the means whereby the qualities or properties of the living structure are sustained by a succession of altering cells.

The general tenor of the argument, several of the illustrations, and some of the conclusions arrived at, will be found the same with those already more ably supported by Liebig, in the third part of the

Organic Chemistry applied to Physiology and Pathology. But as all the reasoning of this celebrated chemist proceeds upon the supposition that *the globules of the blood take no share in the process of nutrition,** it is imperative to show that the origin of animal heat and vital power, with the phenomena of health and disease, may be as clearly and simply explained upon the opposite fact, that *the globules of the blood are the sole agents of nutrition.* Liebig has, indeed, led the physiologist through a vast mine of chemical wealth, and shown him all the changes that can possibly be rung upon the ultimate particles of the matter composing the structure of animal bodies; but I should be sorry to trust any friend of mine in the hands of a medical practitioner whose treatment was to be founded on his physiology and theories of disease and respiration.

The act either of fecundation or self-division is the antecedent of vitality in all living structures; it is the *appointed* means whereby an invisible power is united to a peculiar material form. We have no knowledge of the invisible power of any living thing until the structure or the material form comes within the range of our senses; and then the properties of the visible form are *exponents* of the qualities of the invisible power.

But the visible structure of the human being has a great number of qualities in common with innumerable other forms of organized and inorganic matter; and therefore it is requisite to know something of the higher qualities of matter generally.

To the ordinary observer all inanimate objects

* *Loc. citat., supra,* p. 268.

appear inert and incapable of themselves of originating or maintaining any motion or change. If we see a table or a chair remain fixed before us, we are not apt to regard the elements of which it is composed as possessing any property to which the terms power, force, or energy, could appropriately be applied. Nevertheless, a very little investigation into the constitution and properties of bodies will show that the ultimate particles of all things have an inherent activity or force; and the phenomena which ensue during combustion are a palpable exhibition of forces of a very active kind.

There are persons who, having added nitric acid to quicksilver, gaze on the effervescence and the gradual dissolution, without considering all the wonderful characters of the operation, or asking themselves how the acid has rendered invisible a mass of metal. They may even add to the acid solution a quantity of alcohol, collect the powder which falls to the bottom of the vessel, and make themselves acquainted with its powers and properties; yet they will still speak of the materials and the compounds as nothing more than *brute matter*. There are others who will watch the crystallization of a salt, observe the forms in a flake of snow, or feel an interest in the portrait painting of the sun, and be content with admiration; but if the ultimate particles of the matter which are active in dissolving the quicksilver, and those symmetrically arranged in the crystals of a flake of snow, are, as chemistry informs us, identical with those employed in building up the visible structure of living things, we cannot so lightly dismiss these striking pheno-

mena, though they be familiar and *only chemical facts*.

"The *inherent activity of matter*," says Sir J. Herschel, "is proved not only by the production of motion, by mutual attractions and repulsions of distant or contiguous masses, but by the changes and apparent transformations which different substances undergo in their sensible qualities."*

"It is certain," says Lord Bacon, "that all bodies whatsoever, though they have no sense, yet they have *perception*; for when one body is applied to another there is a kind of election to embrace that which is agreeable and exclude or expel that which is ingrate; and whether the body be alterant or altered, evermore a perception precedeth operation, for else all bodies would be alike one to another. And sometimes this perception in some kind of bodies is far more subtle than the sense, so that the sense is but a dull thing in comparison of it: we see a weather glass will find the least difference in heat or cold when men find it not; and this perception also is sometimes at a distance as well as upon touch as when the loadstone draweth iron."†

"I am prepared to admit," observes Dr. Faraday, "both with respect to the attraction of aggregation and chemical affinity, that *the sphere of action of atoms or particles extends beyond those other particles with which they are immediately and evidently in union*. Thus in water a particle of hydrogen in combination with oxygen is considered as not *altogether indifferent* to other particles of hydrogen,

* *Preliminary Discourse*, p. 297; also pp. 59, &c.

† *Sylva Sylvarum*, p. 171, edition 1651.

but to have an affinity or attraction towards them; and *in many cases this affinity produces effects rising into considerable importance.*"*

The "inherent activity" of Herschel, the "perception" of Bacon, the "non-indifference" of Faraday, the "elective affinity" of the chemists, or the "polarity" of electricians, are only different modes of giving expression to the very evident fact that the Creator has endowed all particles of matter with extraordinary invisible powers or qualities.†

Now the particles of matter are probably not at one time endowed with an "inherent activity," and at another deprived of it altogether; it is neither philosophical nor consonant with the phenomena to suppose that inert materials can invest themselves with any kind or degree of energy or activity whatever, or that when once possessing they can divest themselves of it; hence the condition of repose in which visible objects frequently appear, if it does not arise from the absence of an "inherent activity," must be referred to an equilibrium of opposing forces. As long as this equilibrium is maintained

* *Experimental Researches in Electricity*, pp. 150, 180, &c.

† It has always appeared to me that the sun has been too much neglected in our estimates of the "inherent activity" of the ultimate particles of matter. What this globe would be without the sun, or what would then be the characteristics of matter, we cannot tell; his rays are hourly rendering invisible that which in their absence again becomes visible; by the withdrawal of his influence only for a few hours water becomes solid; and thousands of instances, nay, perhaps, all the instances of activity in matter may, in a more or less remote degree, depend upon the sun. This supposition would remove the *antecedent* of the phenomena of motion and activity in matter a step further; but it would not affect the laws or general expressions deduced by observation, nor would it alter the conclusions drawn from the views taken in the text.

among their ultimate particles, bodies have fixed qualities or properties; as long as it is maintained by the mass, the body is at rest. But whenever this equilibrium is disturbed, either among the ultimate particles or in the mass individually, then properties alter, and the phenomena of force or power begin.

A series of disturbances, of decompositions and recombinations among the ultimate elements of inorganic bodies, may be so disposed or arranged together as to render manifest a force or power, which has so far an independent character, that it may be conducted or led away from the materials in which it originates, and made to act upon bodies at a distance from its source, so as to put them in motion, to raise their temperature, and otherwise alter their sensible properties.*

In the fifth, sixth, seventh, and eighth series of Faraday's *Experimental Researches in Electricity* there are numerous facts expressly adduced by this highly-gifted philosopher to prove—

1st. That the physical power ostensibly originates from the body experiencing decomposition.

2nd. That the greater the number, or related series of decompositions and recombinations, the greater the apparent amount (certainly the greater the sensible effects) of the power.

3rd. That a peculiar order and arrangement of parts is necessary to aggregate the power, to make us sensible of it, and to render it useful.

In the order and arrangement here spoken of as necessary to give activity and effect to the physical power, there is, unquestionably, a species of struc-

* *Vide Daniell's Introduction to Chemical Philosophy*, p. 405.

ture—a methodical allocation—for the purpose of obtaining an aggregate result from the changes which take place; this aggregate result being on the one hand an invisible, energetic, and abstract power; and on the other, the visible saline compounds or fluids which have served their turn in the operation.

If I required a solution of sulphate of zinc, tinctured with copper, I should probably place the two metals and sulphuric acid diluted with water indiscriminately together; I might watch the effervescence, and content myself with the product, without having the slightest idea of any abstract power passing away unperceived; but, if having gained a knowledge of the power, and wishing to obtain it without caring for the sulphate of zinc, then I must make a peculiar and regular order in the disposition of my materials: one system of decompositions must be separated from another, and yet they must be connected with each other; they must, in fact, form a regular structure of distinct and separate and yet connected parts. If I would vary the results to be obtained from the activity of the power, I must vary the number and size of the separate parts; increase or diminish the series; and, lastly, if I wish to render the action continuous, I must at short intervals add fresh materials and draw away the old.

Most persons greatly undervalue the results of every-day experience, and allow common events to pass without consideration; "thereby," as Daniell remarks, "neglecting the first rounds of that intellectual ladder by which the loftier heights of

philosophy must be scaled."* For example, let us observe a dancer on the tight rope: remark its bending under his weight; its re-bounding when the weight is removed; and the strength and elasticity it displays. Suppose we had never seen these properties before, and anxious to know in what and where they reside, proceeding to an examination with forceps, knife, and scissars, we begin by removing all the exterior fibres; and finding that they have no apparent influence, reject them, expecting to discover a peculiar mechanism beneath. What would be our surprise to find the power or properties we search for, failing gradually under our operation, and all our labour to result in nothing more than fibres identical with those which we at first rejected, and none of which explain the whole elastic power and strength; moreover, the further the research was carried the more perplexing the cause we seek; for although we might discover a certain minute and fractional part of the cohesion and elasticity in each separate fibre, yet even this remnant would seemingly depart, when they are reduced to atoms, to hard inelastic particles, at some distance from each other. But now let us suppose the subject be examined in a different way: we may first remark that the rope is coiled; that the coils are made up of smaller strands; that these also are coiled or twisted, and composed of numerous threads; and, lastly, that the threads contain the fibres; it will then be evident that *numbers and structure*, or *association and arrangement*, are most important circumstances in sustaining and rendering evident the strength,

* Introduction, *supra*, p. 3.

cohesion and elasticity of the rope.* Single fibres may be picked out and taken away from the rope without any apparent diminution or alteration in its strength or power, and yet it is evident that every filament has its share in sustaining the power. If a weight were suspended over our head by *a cable*, we might, probably, be indifferent to the picking out of a few almost invisible threads; but would anybody allow this simple operation to be indefinitely continued? What, therefore, a single fibre does not do, and what it may *appear* to have no share in doing, is really accomplished by the numbers and arrangement of precisely similar fibres. Every particle of sand in the hour-glass is as necessary to the true indications of the instrument as every other; and yet, two, three, or four grains may be taken from the mass without any sensible or perceptible effect; nevertheless the abstraction of a single grain must have its influence on the time marked by the falling of the remainder.

The following general conclusions are deducible from the preceding facts and observations:—

1st. The invisible ultimate particles of all kinds of matter are endowed with an "inherent activity."

2nd. Two or more ultimate particles, associated or incorporated together, form an aggregate or compounded element, which may or may not be visible; each compound element having peculiar qualities or properties arising from the abstract nature and the "inherent activity" of the ultimate

* Into how many structures and to how many different uses might not an ingenious mind convert a ball of twine? In how many different ways might not the qualities of the elementary fibres be made to exhibit various degrees, phases, and conditions of power?

particles composing it; such, for instance, are atmospheric air, carbonic acid, olefiant gas, and arsenuretted hydrogen.

3rd. Several invisible ultimate particles, or several invisible compound elements, associated or incorporated together, constitute the visible forms of matter; each form having its own properties, which are determined not only by the nature or "inherent activity" of the ultimate particles, but likewise by the arrangement or allocation in which they are disposed with regard to each other.

4th. As long as the arrangement of the ultimate particles or elements composing an invisible or a visible form of matter, remains unaltered, the qualities of the form are fixed and stable; but when the arrangement is changing or varying, the qualities or properties of the form alter, the evidence of force begins, and very striking phenomena frequently result.

5th. The power or force of a galvanic battery or a steam-engine, although originating from the matter undergoing decomposition, is, nevertheless, as we witness it—*an aggregate power, the function of a peculiar structure.*

Lastly. Although individual elements may be abstracted from a structure without visible or sensible effect, still the abstracted element may be equally as essential in maintaining the visibility of the structure, or in sustaining its aggregate power, as any of the other remaining elements.

Now, as the ultimate particles or elements of all living bodies are of the same kind or nature as those most energetic in inanimate and inorganic

bodies, so therefore they have the same "inherent activity;" and being in a constant and ceaseless state of change, throughout a series of detached, and in one sense independent, and yet connected and dependent cells, it follows, (unless the contrary can be proved,) that a certain amount of power or force must be the result. Also, as the secreting and all the nutritive organs of the body are structural arrangements, in which changes are going on, they can scarcely be supposed limited in their office merely to the production of what is termed "*a secretion;*" on the contrary, there being a large amount of "perception," or "susceptibility" and power, quite distinct from consciousness and volition, to account for, it is much more probable that their real function is a *dynamic function,* and that the secretions flowing from them are the visible remains of the materials which have ministered to the function. All living beings afford abundant proofs of a perception, or susceptibility, which is a quality of their structure, and upon which motion follows; it is, therefore, necessary to mark intelligibly the characteristics of consciousness and volition, the unity of thought and personal identity, as distinguished from the perceptions and powers of the altering living structure.

First, then, all voluntary movements are determined and controlled, excited and arrested, by the WILL; yet still there is *an intermediate agent,* for in paralysis the *will* to move the affected limb may be as strong as ever, yet no voluntary movement follows; secondly, in all fits or convulsions—in hysteria, chorea, and epilepsy—powerful and energetic move-

ments are performed without any consciousness or volition, and sometimes in opposition to the efforts of the *will;* thirdly, the consciousness of volition or thought is one and indivisible; it cannot be more nor can it be less; it has no aggregate quality; whereas the structural susceptibility and power, with the motions following therefrom, may be increased or diminished, and vary as the condition of the body varies.

Hence, therefore, the conclusion necessarily is, that there are in the living human body two distinct kinds of "perception," and two distinct kinds of "power:" the one is the simple perception of consciousness, and the single power of volition; and the other, which is a totally different thing, is the aggregate perception of the structure, and the aggregate power arising from the ceaseless changes of its elementary particles. The former constitutes personal identity; the latter is the immediate antecedent of all vital or involuntary movements, and the agent intermediate between volition and the living structure in voluntary motions.

It may, perhaps, be objected that it is impossible to conceive two distinct and totally different agents—such as the aggregate perception and power of the living structure, and the simple, not aggregate, perception and power of consciousness and volition, in one nature; but it is not more difficult than to conceive that *one* and *one* make *one*—a proposition which the chemist daily calls on us to assent to, and which is involved in all the facts and principles of the science; nor more incomprehensible than the familiar fact, that the properties of one body are

veiled in the properties of another body by combination, while the properties of the resulting compound differ *in toto* from either of its components.

There is considerable difficulty in adopting an unobjectionable phraseology upon the subject of vital phenomena. Although we have the authority of Bacon for the use of the term "perception," to express a quality of matter entirely distinct from personal consciousness—an antecedent upon which motion follows; yet as this term has been so generally limited to a far higher and totally different quality of consciousness, it is desirable to fix upon some other general expression, which shall, without fear of error, enunciate that important quality, power, or inherent activity, which is accumulated in all living structures by the nutritive changes, and in animal bodies expended by the *will*. We have, it is true, the terms irritability, organic power, vital force, and sensibility, as when we speak of the sensibility of plants and leaves to light and heat, or of seeds to warmth and moisture, and yet deny them sense; but neither of these terms fully express a power consequent on the changes in a living structure, existing in possibility as well as in act, in efficacy if not in actuality; an energy which may be in a state of induction, as it were, or in operation, and which has the same relation to the altering materials of the living structure, that the physical power has to the altering materials in the generating cells of the battery; an energy which is expended in a ratio with the primary elements, or cells of the structure, by fasting, mental emotions, voluntary exercises, or intellectual employments; which is

impaired and modified in a thousand different ways, by an abnormal nutrition, by impure air, or an impoverished diet; and which is restored by pure air, invigorating food, rest and sleep.

Whatever may be the term we use to designate this energy, potentiality, or power, it is of the utmost practical importance to bear in mind its invariable ratio to the function of nutrition, on the one hand; and, in all normal conditions, its subservience to the intellectual power, or *will*, on the other.

It would be departing entirely from the object of these researches to enter upon the question, how much of a complex visible motion in the body—such, for example, as is witnessed in fits and convulsions, or in confirmed and inveterate habits—is due to the aggregate potentiality of living structure, and how much falls within the limits of the *will;* but there is a large class of disorders embraced under the term *hysteria,* in which we seem to see two opposing or conflicting powers, certain structural phenomena, which a firm and determinate resolution in volition will sometimes subdue and overcome. Here, then, our inquiry presents us with a broad practical rule, which we may venture to lay down, viz.:—

That all the visible motions and affections of the body, which are distinct from, or continued in spite of the *will,* may generally be modified or removed by altering, increasing, or diminishing the nutritive changes of the structure; and it may be affirmed generally, that the *will* having a large control over

the materials received within the body, and therefore indirectly over the nutritive changes, is responsible for the origin of many bodily diseases. There are, indeed, many interfering circumstances in the habits and occupations of life, and especially with regard to the air we breathe, whereby injurious agents gain insensibly and involuntarily an entrance within the body, and set up injurious changes; nevertheless, the affirmation or rule is true generally.

The general physiological and pathological deductions from these researches are:—

That the animal heat, the structural perceptions, and vital forces, with the motions arising therefrom, in the living body, although primarily originating from the act of fecundation, are, nevertheless, as we witness them, *aggregate consequents*, of which the unceasing nutritive changes of matter within myriads of temporary altering cells are the *antecedents*.

Every cell, and every surface upon which cells are distributed, has a share in maintaining these consequents, analogous to that which every atom of water, acid, and metal, must have in sustaining the power of a galvanic battery, or to that which every fibre has in maintaining the power and elasticity of the rope.

Health, therefore, is a very complex aggregate, vibrating as it were between innumerable points, and is dependent upon a certain amount and order of change of matter in a given time; and the almost endless forms of disorder or disease are severally departures from this amount and order of change.

If the departure or deviation, whether in excess, deficiency, or alteration, occur generally throughout the whole or the major part of the organs of the primary nutritive changes, or the blood-cells, the disorder will be of a general nature, and peculiar phenomena will mark their circulation through and their exit from the system. If, on the other hand, the departure or deviation be of a less general nature, consist of a local increase or diminution of the nutritive changes, or of cell-life, in particular organs, the phenomena will vary accordingly; and, lastly, if the nutritive changes be altogether heterogeneous to the normal tissue, then the form of the disorder will be peculiar on that account.

Finally, all the experiments and observations that I have made have tended to confirm the conclusion that it is the special office of the circulation to bring the colourless blood cells to the part, and therefore to negative the supposition that they are produced in any way from the liquor sanguinis, or multiply by the growth of the molecules of the tissue. *Congestion,* therefore, according to my interpretation, implies a fulness of, and an increase in the calibre of the capillary, and other minute vessels, with a preternatural redness in the part, but without any increase, or acceleration in the process of nutrition, on the contrary, that may be diminished. *An accelerated nutrition* is something more than a congestion; it is a condition in which the colourless blood cells are, in a peculiar manner, accumulating and experiencing active changes in the part; entering into the composition of the tissue with unusual rapidity; the rate of

acceleration being at least one of the elements determining the physical character and the microscopical appearances of the tissue, or of the cells and their products. Increase in the bulk of the tissue, or *swelling*, will therefore be one of the chief characteristics of an accelerated or abnormal nutrition.

The term *inflammation* I would confine to a still more exalted and abnormal process of nutrition, in which the red corpuscles of the blood are not only detained in the part, but are also, with the colourless cells, entering into the composition of the tissue, adhering or sticking to the fibrous or friable walls of the capillaries, minute venous, and arterial ramifications.

This interpretation of the essential characteristics of inflammation is warranted by the results of my researches; the attendant *pain* and *heat* are the expected phenomena, arising in consequence of the red cells performing *in the tissue*, those changes and transformations which ought to have been previously perfected and concluded *in the circulation*.

According to these definitions, more than one-half of the conditions to which the term inflammation is now applied would come within the category of an accelerated nutrition. *A determination of blood* is a very general and very indefinite phrase, embracing all the three conditions just enumerated, and many others.

It occurred to me some time ago to subject the *Paramœcium Aurelia* to an experiment similar to those described in pages 248, &c., *ante*. Since the

printing of the foregoing sheets I have succeeded in obtaining an abundance of these animalcules in an infusion of chopped hay in pond water, kept in a somewhat dark place; I found them, with other polygastrics, forming a white line round the glass, about a quarter of an inch below the surface of the fluid, and I obtained myriads in a single drop of the water.

EXPERIMENT. (*Paramœcium.*)—On adding to a drop of water containing a great number of these animalcules, a drop of liquor potassæ, and stirring them well together, I found all the animalcules burst open, and then nothing could be seen in the fluid by the microscope except molecules and granules.* The fluid was now extremely cohesive or glairy and tenacious; it could be drawn out with the point of a needle into long strings or filaments, and it resembled mucus; on adding a little dilute acetic acid, copious white flakes appeared, which exhibited a fibrous appearance, studded with molecules and granules, analogous to that of mucus, and to that already described as resulting from the application of the same reagent, to the transparent mucus-like fluid obtained by the rupture of the blood and pus corpuscles.†

"Among the many wonderful and beautiful objects displayed by the microscope, there are none exceeding in interest the ova and the bundles of seminal animalcules of the common earth worm (*Lumbricus*

* *Vide* First Series of "Researches," *loc. cit.*, p. 235; also pp. 273, &c.

† I shall endeavour to procure the aquatic *larva* mentioned to me by Dr. Carpenter, and institute a similar experiment upon the colourless cells of that creature, and I fully anticipate similar results.

terrestris); and from their size they are admirably adapted to display the singular effects of liquor potassæ. Mingled with these objects are numerous cells, containing in their interior molecules and granules, in the greatest state of activity; they are continually shifting their position within the cell, presenting exactly the same appearance as those molecules and granules which I observed in the colourless corpuscles or cells from the case of catarrh before related. On the application of liquor potassæ all these molecules and granules were quickly ejected, and their restlessness and motions, after they were discharged from the cell, were very singular; but not more remarkable than the motions of the molecules discharged from the lymph globules of the frog, or from the colourless blood corpuscles and pus corpuscles of man."*

EXPERIMENT. (*Cells of Lumbricus terrestris.*)—A drop of water mingled with the above mentioned objects is rendered white and milky; but when well mixed with liquor potassæ, it becomes transparent, glairy, and mucus-like; and when dilute acetic acid is afterwards added, there is the same fibrous appearance as is presented in ordinary mucus from this reagent.

Similar experiments have been made with the colourless blood cells of the earth worm, and with the red-blood cells of the frog, with similar results.

Now, all these colourless and coloured cells are administering to the functions of animal life, in some cases constituting the entire individual, as in

* "Experimental Researches," *loc. cit.*, pp. 275, &c.

the polygastrics; in others, sharing in the structure, and therefore they are analogous to one another, at least in this respect. The experiments just related, with others contained in the former series of "Researches," show a remarkable identity in the chemical reactions of liquor potassæ on their interior contents, as well as on their exterior integument; moreover, all the colourless cells contain myriads of molecules and granules, which may on various occasions be seen moving within the cell, and which, when discharged or forced out of the *living* cell by liquor potassæ, exhibit peculiarly vivid motions, from whatever department of the animal kingdom they may be observed.

The red colour of blood-cells in the higher orders of the animal kingdom is, in my opinion, only a phenomenon or appearance, characterizing a particular stage of their life or existence, and analogous to the colour of a petal; which is also a phenomenon marking a particular stage in the series of developments occurring between the bud and the ripe capsule or seed-vessel in some plants. The really essential structure, in both instances, is situated in the axis or centre of the coloured envelope, and, in both, gradually increasing in size and importance as the colour fades.

These facts and analogies appear to me to substantiate the conclusions already stated, viz., that the antecedent or cause of motion, or the aggregate perception and power of living bodies, cannot be traced to any essential peculiarity in the primary vitalized elements, but must be referred back to the act or point of fecundation, which determines

the species—the configuration of the organism—the size and characteristics of the structural arrangements—and the mode and rate of nutrition—*i. e.*, the time occupied in the duration of the individual life of those cells, the aggregate of which gives form to, and sustains the properties of the living structure.

To these additional remarks, I cannot forbear subjoining the following extract from Lord Bacon's *Sylva Sylvarum*, a work too well known to require from me aught of praise or commendation; but which has yet to be thoroughly appreciated by the practical physiologist:—

"The nature of *vivification*," says the noble author, "is very worthy the inquiry; and as the nature of things is commonly better perceived in small than in great, and in imperfect than in perfect, and in parts than in whole, so the nature of vivification is best inquired in creatures bred of putrefaction. The contemplation whereof hath many excellent fruits: first, in disclosing the original of *vivification;* secondly, in disclosing the original of *figuration;* thirdly, in disclosing many things in *the nature of perfect creatures* which in them lie more hidden; and fourthly, in tracing, by way of operation, some observations in the *insecta to work effects upon perfect creatures.* Note, that the word *insecta* agreeth not with the matter, but we use it for brevities, sake, intending by it creatures bred of putrefaction."*

To conclude. In every inquiry into the phenomena of life, by far the most positive fact that can be known is brought prominently under our consi-

* *Sylva Sylvarum*, cent. vii., p. 143; edition 1651.

deration: a fact which is the source whence all knowledge flows, and which must precede and accompany all our researches.

This fact, or truth, is the existence of an internal feeling of our own personal identity and unity. Neither the divisibility and qualities of matter, nor any appearances reaching us from without, can in the slightest degree weaken this conviction; on the contrary, they rather tend to strengthen and confirm it.

In studying the phenomena of external nature, every thing exhibits a multiplicity of operations and changes, an endless divisibility of parts, and the influence of motion, numbers, and arrangement, in the production of sensible effects. But when we turn inward upon ourselves, and contemplate the feelings and consciousness of self, although we meet with great complexity and variety, yet here there is a principle of unity, an individuality in which all feeling centres. This perfect conviction of unity and identity, springing up, as it were, or maintained and supported by such a multiplicity of parts and operations, is incomprehensible to our reason, the great mystery of man's nature, and beyond the range of his inductive inquiries. After many reiterated but fruitless attempts, from Aristotle down to the present time, to reconcile the qualities and appearances of things without, with the oneness of consciousness and thought within, and to remove the veil thrown over the inscrutable union of the living body, with the intellectual power which governs and controls its movements, the effort has been found hopeless, and has been abandoned.

The primary atoms or particles of matter have their origin a long way within the precincts of the unseen world, and possibly they may experience a thousand combinations before they approach the limited circle of the human vision; how little, therefore, can we really know of matter, of the really essential elements of living structure! A person, counting as fast as possible, can enumerate twenty in five seconds; and keeping on at this rate night and day, without intermission, for *four hundred years*, he might accomplish the enumeration of the living structures in half an ounce of blood, a quantity which any one may part with without harm or detriment; yet every particle—every such living structure—is as essential to the aggregate phenomena of life as any antecedent can be to its consequent.

It is not my intention to enter into any metaphysical disquisition, yet I cannot omit here observing, that volition may properly be considered under two distinct points of view; thus a man may will to speak, or be silent, to take off or put on his hat; and he has at his command the structural power and bodily configuration to realize his wish; if he has not, he is paralytic, or his body is diseased. But if he wills to visit the moon, to fly through the air, or stay his descent when falling from a height, his will must remain a wish or a desire, for he has neither structural power nor bodily conformation to accomplish such a wish. In the former case, his inabilty is a deprivation and a loss, which may possibly be remedied; in the latter, it can hardly be

viewed in the same light, at all events it is irremediable. Corporeal or structural power, therefore, limits the *operations* of volition; but the boundary of knowledge is the only confine to our *desires*.

The Christian philosopher pursues his investigations with a settled belief that an ALMIGHTY CREATOR exists; and having in view only the discovery of those general laws, which may be deduced by the contemplation of a particular class of facts, or series of phenomena or appearances, he does not speculate on the *abstract nature* of matter or force; neither does he try to know what becomes of this or that invisible power, when, as in the example of the voltaic pile, he is able at his will to concentrate and direct, or to dissipate and annul it; nor when he heats and cools a bar of iron is he disappointed because he is ignorant of the nature of heat, and cannot tell how it comes or goes. On the contrary, he knows that in all, even in the simplest or most common cases, there must be residual phenomena or ultimate facts, quite beyond his comprehension; he, therefore, does not doubt the *possibility* of forms of power existing in a very different state, and under very different arrangements to any he witnesses here. "The possibility," to use the words of a distinguished writer, "of the occasional direct operation of the Power which formed the world, in varying the usual course of events, it would be in the highest degree unphilosophical to deny."* But belief beyond reason is based upon grounds entirely distinct from

* *Inquiry into the Relation of Cause and Effect*, by R. Brown, M.D., F.R.S.

those arising within the scope of any *experimental* research; the object of which is, in all cases, to remove the *antecedent* or the primary phenomenon as far back as possible, and to discover the combinations, appearances, and results, as they are, without questioning those which a Supreme Intelligence has willed they shall be.

Bearing in mind, then, the true aim and scope of all inductive researches, it is evident to whatever extent they may be carried, on the subject of life, or whatever may be the forms of expression, which the inadequacy of language may constrain us to adopt in explaining the phenomena, we can arrive at no other conclusions than those convincing us of *our utter ignorance,* except from Revelation, *of the real origin or final destination of any form of power.*

EXPLANATION OF THE PLATES.

PLATE I.

FIG. 1.—Red and colourless blood corpuscles; *the former* banded together; *the latter* preserving their figure, and standing alone.

FIG. 2.—Red and colourless blood corpuscles *immediately* after the addition of a drop of water; *the former* become fainter, granular, and smaller; *the latter* enlarge, showing a dark molecular centre, surrounded by a bright circumference or ring.

FIG. 3.—Colourless blood corpuscles *five minutes* after the addition of water; they are still larger, lose all appearance of a distinct central portion, and appear filled with dark molecules, some of which are more conspicuous than the rest.

FIG. 4.—Colourless blood corpuscles *fifteen minutes* after the addition of water; the outer envelope partially ruptured, and the molecules escaping.

FIG. 5.—A blood-vessel in the transparent membrane of a fœtal hare; showing altered colourless blood corpuscles, incorporated with the fibres forming the walls of the vessel.

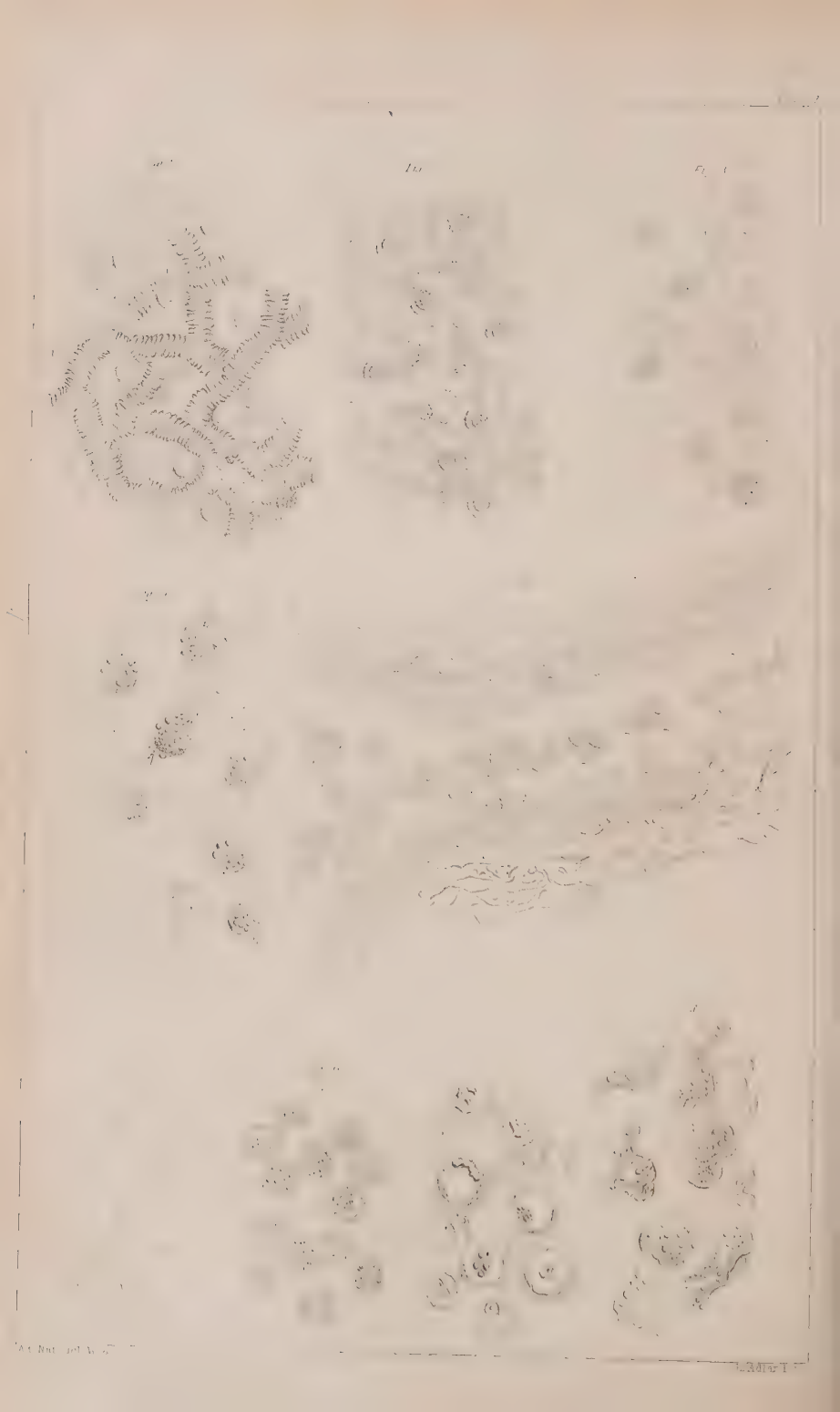
FIG. 6.—(*a*) Colourless blood corpuscles; (*b*) the same after the addition of water, and resembling mucous globules; (*c*) their appearance, with granules, discs, or nuclei, after the addition of diluted acid, and resembling many of the common forms of pus globules; (*d*) the effect of of a weak alkaline solution; the corpuscles first pass through the stage (*b*), and then burst open, discharging their contents.

PLATE II.

FIG. 1—Represents, theoretically, the normal process of nutrition. The colourless blood corpuscles first adhere to the walls of the capillaries; they then contribute to form the walls, and pass through the altering tissue, being evolved upon the nearest free surface in the form of a secretion, epithelial scales, or mucous epithelium.

FIG. 2—Represents, theoretically, an abnormal process of nutrition. The colourless blood corpuscles are in much greater numbers, passing through the altering tissue, and thrown off in the form of pus globules or imperfect epithelial cells.

FIG. 3.—(*a*) Colourless corpuscles shrivelled, from a tear collected at the corner of the eye; (*b*) the same corpuscles *two minutes* after the addition of a drop of water; they resemble in all respects colourless blood corpuscles treated in the same way; (*c*) the same corpuscles *five minutes* after the addition of the water; (compare this figure with fig. 4, plate 1); (*d*) the same corpuscles *twenty minutes* after the addition of the water; they display a complicated structure, with a corrugated central matter; the outer integument in some of them has burst open, and molecules and granules are escaping; (*e*) the same corpuscles after the addition of a little weak liquor potassæ; the outer integument has burst open, and become variously contorted, the molecules and granules escaping; (*f*) epithelial scales, of various forms, from a tear.



H. Adlard sc.

ESSAYS AND CASES.

ARTICLE IV.

ON THE CHANGES INDUCED IN THE SITUATION AND STRUCTURE OF THE INTERNAL ORGANS, UNDER VARYING CIRCUMSTANCES OF HEALTH AND DISEASE; AND ON THE NATURE AND EXTERNAL INDICATIONS OF THESE CHANGES.

BY FRANCIS SIBSON,

Resident Surgeon to the General Hospital, near Nottingham.

It is now some years since I found that my notions of the usual and healthy sites of the various viscera were ill defined. To clear up this obscurity, owing to which I was constantly at fault in examining patients suffering from chest diseases, I took diagrams of the position of the viscera, when making *post mortem* examinations of the patients that died in the General Hospital near Nottingham. I first drew a careful outline of the ribs and sternum, and then added the internal viscera, taking care that their bearings to each other, and the ribs, were accurately planned. The diagrams 2, 10, 21, and 26, were constructed in this manner.

After a time I procured a frame, and stretched strings across and along it, at distances from each other of three inches; the whole frame was thus subdivided into 45 squares. I ruled a piece of paper with squares of a like fashion, but of one-third the size: the frame I laid over the subject to be copied, and with care and accuracy traced the objects that were behind each three-inch square upon the corresponding one-inch square on the paper. The diagrams 4, 5, 12, 17, and 24, were thus framed.

I showed these diagrams, from time to time, to Dr. Hodgkin; he was interested in them, said they were of value, and gave me many important hints regarding them. Last winter Dr. Hodgkin exhibited and explained many of the diagrams at one of the conversaziones at St. Thomas's Hospital, at the time when the medical school of that Institution had the advantage of his services.* Some months before these diagrams were thus brought before the profession, Dr. Hodgkin suggested to me a plan for taking them, which I immediately adopted—a plan that placed my inquiry on an entirely new and more solid footing. This method consists in drawing the outlines of the organs on a piece of lace, stretched on a frame and placed over the body; the sketch is transferred by placing the lace over a sheet of paper, a piece of the "manifold letter writer paper" being interposed. By pressing firmly with a point on the chalked outlines they are traced in black on the paper beneath. By this plan, employed with care, perfect accuracy is ensured. It has the ad-

* See Appendix.

vantage also of being applicable to the living as well as to the dead.

To reduce these full-sized diagrams to their present dimensions I employed a pentagraph that was recommended to me by Dr. Hodgkin.

It is truly gratifying to me to acknowledge here the kind assistance which I have received in carrying on these researches from the medical officers of the hospital in which I have the honour to be resident surgeon.

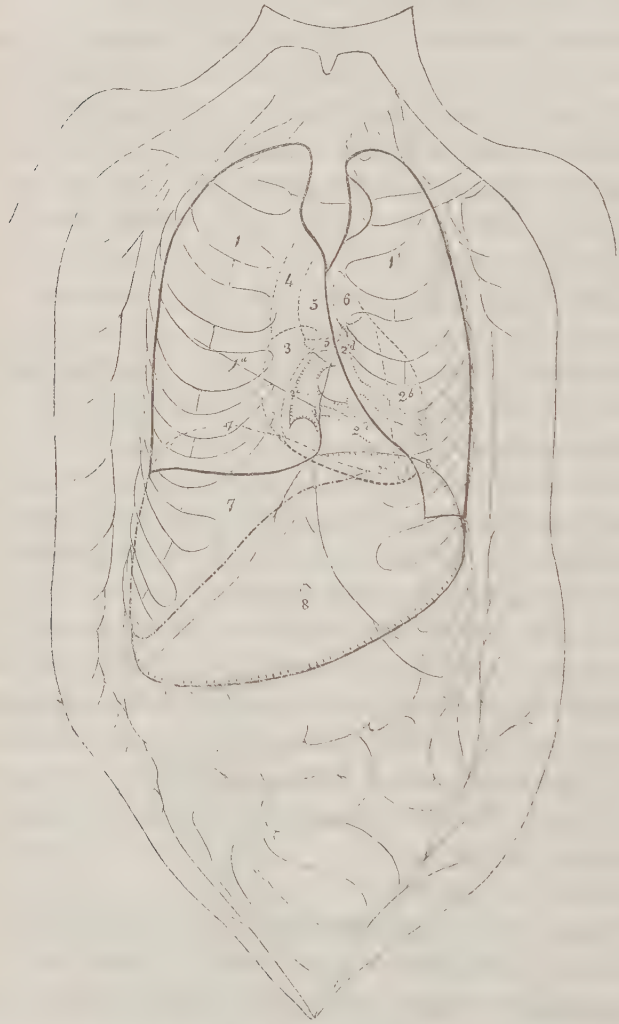
My friend, the lamented Dr. Davidson, late senior physician, the present physicians, Dr. Hutchinson, Dr. J. C. Williams, and Dr. Storer, and the surgeons, Mr. Wright, Mr. White, and Mr. Attenburrow, have given me their sanction to examine and publish their cases. Mr. Wright was the first to notice the importance of my pursuit, and to encourage me to persevere in it. Dr. Hutchinson and Dr. J. C. Williams favoured me from time to time with serviceable assistance; and from Mr. H. Attenburrow I have derived some useful improvements in the mode of constructing the diagrams. I must not forget to name the repeated aid afforded by Mr. Shepperley, and the alacrity with which my apprentices, especially Mr. Ashwell, lent their helping hands.

ACTUAL AND RELATIVE POSITION OF THE HEALTHY ORGANS—LUNGS AND HEART.

Portion of Lung above the Clavicle.—If by the word chest, as applied to the human subject, is meant the subdivided cavity in which are contained the heart and lungs; it will be found, in part, to occupy

1.—ORGANS HEALTHY,

WILLIAM WIDDOWSON, AGED 27, PATIENT OF MR. WRIGHT, DIED FROM SEVERE INJURY—COMPOUND FRACTURE OF THIGH.



1. Right lung; 1*a*. Division between upper and middle lobe; 1' Left lung.—2*a*. Left ventricle; 2*b* Right ventricle; 2*c*. Tricuspid valve; 2*d*. Mitral valve.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary Artery.—7. Liver.—8. Stomach.

Where the organ lies immediately below the surface, its outlines are dark; where the organ is deep seated, its outlines are faint.

Weight of Organs.—Right lung, 20 ounces; left lung, 15 ditto; liver, 35 ditto; spleen, 4 ditto.

the lower portion of what is usually termed the neck, as the summit of the lung rises from an inch to an inch and a half above the clavicles. A clear knowledge of this supra-clavicular portion of lung (diagrams, 1, 3, 4, 5, 8, 11, &c.) is of the first moment in forming a diagnosis where incipient tubercles exist; here are these tubercles first formed; here may they be earliest detected.

In front, behind, and on the outside, the portion of lung in question is rounded; it rests upon the first and second ribs, near their spinal attachment. (Diagrams 1 and 6; and for posterior view, diagram 7.) It is protected on the outside and in front by the scaleni muscles. (Diagrams 1 and 25.) The pleura which covers it is strengthened and brought under muscular controul by a fascia, the expanded aponeurosis of a small muscle, the pleural scalenus, (diagrams 1 and 11,) arising from the transverse process of the last cervical vertebra, and inserted by a dome-like fascia into the whole of the upper edge of the first rib. The internal posterior surface of the upper portion of lung is separated from its fellow by the first and second dorsal vertebræ, the œsophagus, and the trachea. The anterior internal surface is hollowed, and, as it were, pushed aside by the great vessels passing to and from the chest.

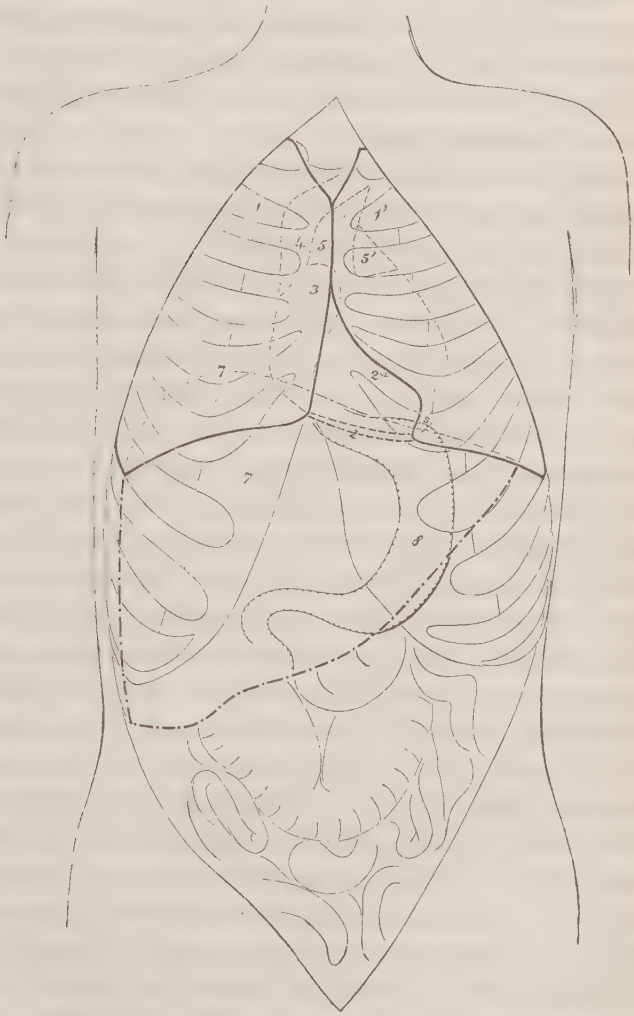
Lung behind the Clavicle.—The lungs lie immediately behind the sternal ends of the clavicles, points where an examination of the comparative density of the two lungs may be made with ease and accuracy, whether in the sitting, standing, or lying posture. Unbutton the patient's shirt, give a

tap or two over the clavicles, just to the outside of the sternum, and the ready answer will tell you whether the lung is consolidated by or free from tubercles. This little convenience in diagnosis is of much value when time presses and allows of but a slight examination.

Lungs behind the Upper Half of the Sternum.—The inner portions of both lungs rapidly converge and usually come in contact, two thin layers of pleura intervening, just behind the junction of the first and second bones of the sternum. (Diagrams 1, 2, &c.) The thymus body separates the lungs in children ; (diagram 5 ;) and in boys, where the absorption of that body is not yet complete, the point of contact is lower than in adults ; (diagram 4;) in old age and emphysema, on the other hand, the lungs meet each other above the usual point. (Diagram 20.) The inner margins of the lungs lie side by side, just behind the centre of the sternum, as low as the junction of the fourth costal cartilages to the sternum, where they separate ; (diagrams 2 and 11 ;) but the place of separation varies considerably, ranging between the point opposite the third cartilages, (diagrams 1 and 9,) and that opposite the fifth. (Diagram 4.) In pericardial effusion the bulging forward of the swollen sac thrusts aside the inner edges of the lungs, and raises the point at which they separate, thus affording an index to the discovery of that disease. (Diagrams 5, 12, and 19, where the pericardium has been artificially dilated.) In cases of diseased heart, with adherent pericardium, (diagrams 23, 24, 25, and 26,) the point of separation is almost

2.—ORGANS HEALTHY.

THOMAS NEWTON, AGED 36, GROOM, DIED FROM DISEASE OF BRAIN.



1. Right lung; 1'. Left lung.—2. Lower bound of pericardial sac; 2 *a*. Ventricles.—3. Right auricle.—4. Vena cava.—5. Aorta; 5'. Pulmonary artery.—7. Liver.—8. Stomach.

Where the organ lies immediately below the surface, its outlines are dark; where the organ is deep seated, its outlines are faint.

Weight of Organs.—Heart, 10½ ounces; left lung, 20½ ditto; right lung, 20 ditto; liver, 50½ ditto; spleen, 5 ditto; kidneys, 5 ditto.

always unusually high, much more so than in cases of diseased heart without adhesion, in which cases the co-existence of emphysema sometimes even lowers the point of separation.

Right Lung behind the Lower Half of the Sternum.—The right lung continues its direct course downwards immediately behind the centre of the sternum, to the attachment of the xyphoid cartilage. (Diagrams, 1, 2, and 11.)

Left Lung to the Left of the Heart.—The inner margin of the left lung, after its separation from that of the right, passes obliquely downwards to the left, usually taking the course of the fourth costal cartilage. (Diagrams 9 and 11.) In some, especially the robust, (diagrams 2 and 3,) and in cases of emphysema and bronchitis, the direction of this line is lower. (Diagram 15.) Disease of the heart, with enlargement, does not affect the direction of this line; but where there are, in addition, pericardial adhesions it is pushed upwards. When the inner margin of the oblique border of the left lung crosses the space below the costal cartilage and rib, behind which it lies, the curve becomes gradually vertical; (diagrams 1, 2, 4, and 11;) towards the lower boundary of the lung this edge usually curves from left to right, and forms a small projecting tongue, which is interposed between the apex of the heart and the ribs. (Diagrams 2, 4, 11, and 16.) In emphysema, bronchitis, and pneumonia, ailments in which the lung's bulk is increased, this internal margin of the left lung encroaches still further to the right, wedging in between the walls of the chest and the heart. Where the heart is

enlarged, this margin on the other hand is pushed out of its usual place. (Diagrams 20 and 21.) In cases of pericardial effusion and adhesion, the displacement is still greater. (Diagrams 22, 23, 24 and 25.) By the careful observation of the direction of the inner lower margin of the lungs, in those cases where there are unequivocal signs of diseased heart, we may generally ascertain whether that disease be simple enlargement, or enlargement with pericardial adhesion, or pericardial effusion.

Space of the Heart's Dulness.—In the living body, where the lungs and heart are healthy, the space of the heart's dulness is bounded to the right by a straight line at the centre of the sternum; above, by a line running along the fourth costal cartilage; to the left, by a curved line usually to the right of and below the nipple, the lower limb of which turns to the right. It is a very thin portion of lung that is wedged in between the heart and the ribs all round these bounds, to ascertain which peculiar tact is required; it is the most difficult lesson in percussion, and, for the discovery of heart disease, the most valuable.

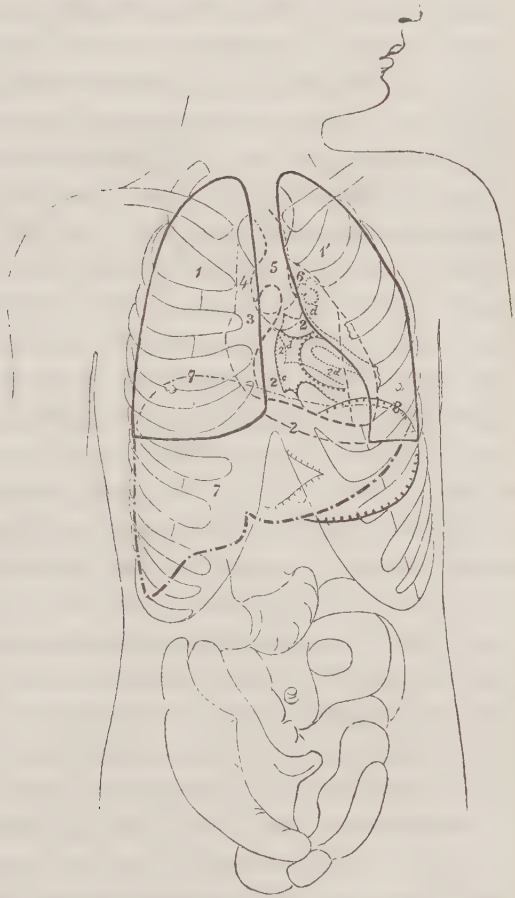
Superficial Percussion.—These superficial margins of lung are best detected by making a slight, superficial, quick, flapping tap, with the right forefinger thrown, jerkingly as it were, upon the left; or upon a pencil, placed as a pleximeter upon the walls of the chest. I have not tried the leaden hammer with a whalebone handle, suggested by Dr. C. J. Williams, but, from its make, I judge it must be, especially to the inexperienced percussor, preferable to the finger for superficial percussion.

Lower Margin of the Right Lung.—The lower margin of the right lung turns off to the right, with a slight obliquity downwards for a short space, (diagrams 1 and 4,) and then passes off almost directly to the right; sometimes there is no obliquity, but the lung turns off sharply to the right. (Diagram 11.) This lower bound of the right lung usually passes across the conjoint cartilages of the sixth and seventh ribs, and then behind the fifth intercostal space; (diagrams 1, 2, 3, and 4;) it sometimes passes behind the fifth costal cartilage, and sometimes on the other hand, as in children, behind the sixth. This lower margin of the right lung is the very fine edge of a very thin layer of lung substance, placed between the costal parietes, and the diaphragm, bulged up as it is by the liver. To ascertain the edge of this portion of lung, the same style of percussion must be resorted to as to ascertain the bounds of the heart's dulness. Any thing stronger, any thing deeper than a light flapping stroke, will bring out, not the sound of the film of lung immediately under the finger, but the dull dead sound of the deeper liver.

Lower Edge of the Left Lung.—The lower edge of the left lung is usually half a rib's breadth lower than the lower edge of the right lung: if that lower edge be behind the fifth intercostal space, the left is behind the sixth costal cartilage. (Diagrams 1 and 11.) If the lower edge of the right lung be behind the upper edge of the sixth costal cartilage, that of the left will be behind its lower edge. (Diagram 4.) The inferior margin of the lung passes almost directly, or with a very gentle slope, to the left.

3.—ORGANS HEALTHY.

ELIZA MAST, AGED 16, PATIENT OF MR. H. ATTENBURROW, DIED FROM THE EFFECTS OF A BURN.



1. Right lung; 1'. Left lung.—2. Lower bound of pericardial sac; 2*c*. Tricuspid valve; 2*d*. Mitral valve.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.

Where the organ lies immediately below the surface, its outer lines are dark; where the organ is deep seated, its outlines are faint.

Weights of Organs.—Heart, 7½ ounces; right lung, 9½ ditto; left lung, 9 ditto; liver, 32 ditto; spleen, 4 ditto; kidneys, each, 4½ ditto.

Contrasted Percussion of the Stomach and Lung.—The stomach and spleen, the diaphragm interposed, are directly behind and below the lower edge of the left lung. The sound on percussion over the stomach is of a very different character to that over the lung; it is reverberating, ringing, empty-barrel-like. The sound of the first tap on the parietes gives rise to vibrations in the cavity, which are echoed backwards and forwards between its walls and centre, and prolong the sound. On percussing over the liver the first sound caused is like that produced in percussing over the stomach; but the liver, on the one hand, acts as a damper, and immediately stops the vibrations; the stomach, on the other hand, takes up the sound and rings away with it until it dies in a faint echo. Now, the lung is half way between these two; it is a good sharp to the liver, but a damp flat to the stomach. The sound vibrations elicited by the first stroke are taken up by the lung and made its own; if the stroke be light the lung vibrations are clear enough, but very shallow, and soon come to an end—there is no dying away; but if the blow be struck over the mass of the lung, as over the third right rib, and if it be direct, firm, and deep, and made on a firm, compact surface, as a dense finger, or, what is better, an ivory or wooden pleximeter, the loud and deep sound is produced. This is taken up and made its own, not merely by the surface, but by the whole substance of the lung, all the air lobules of which, through the medium of their bronchial tubes, form but one large sac, but one infinitely subdivided cell; the vibrations here are, as in the stomach, from

centre to side, interfered with it is true, and in great part muffled by the infinite subdivisions of the lung. The sound, then, though resonant, compared to the dull liver sound, is dull when compared to the ringing stomach sound; it is indeed the dumb peal, it strikes with quite a different tone upon the ear, it tells quite a different tale; and the distinction between the hollow resounding stomach and the muffled lung is quite as distinct, quite as characteristic, as the difference between the dull liver and the, to it, resounding lung.

If the liver be large, as in diagram 10, or, from the stomach being empty, falls over into the space which is usually occupied by the stomach, as in diagram 2, and passes over to the left below the inner edge of the left lung, then the comparative percussion is as on the right side, between the dull liver and resounding lung. If the lower edge of the left lung cannot, as sometimes it cannot, be clearly made out by comparison with the stomach, it may be ascertained where it is above the dull spleen, and the line of demarcation there found will serve as a clue to trace the rest. If the sound of the stomach be too much muffled, by want of gas, to bring out a clear difference in sound between itself and the lung, it will be perfectly resonant, compared with the dull sound of the heart. The boundary of the heart being thus discovered, that of the lung may be readily traced.

Fissures between the Lobes of the Lungs.—The separation between the upper and middle lobes of the right lung is, at its internal edge, usually behind, just below, or just above, the junction of the fourth costal cartilage to the sternum; (diagrams 1, 4,

and 11;) it passes to the right with a slight obliquity upwards, behind the edge of the third rib. (Diagrams 1 and 11.)

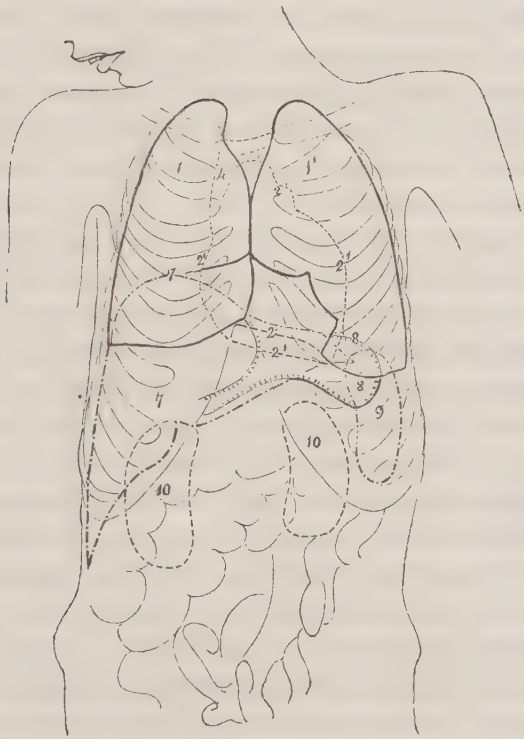
The separation between the middle and lower lobe (diagram 11) is behind the fifth intercostal space, four inches to the right of the sternum; it passes obliquely upwards, backwards, and to the right, behind the fifth rib. The lowest and foremost point of division between the upper and lower lobes of the left lung is behind the fifth intercostal space, four inches to the left of the sternum; it passes upwards, backwards, and to the left, crossing behind the fifth and fourth ribs. As the lower lobe is usually the seat of pneumonia, and as the upper lobe is in general the site of tuberculous consolidation, a knowledge of these bounds is of much value in arriving at a diagnosis in those diseases. It is true that those very diseases vary the position of the separation between the lobes; yet that very variation is characteristic.

Inferior Posterior Bounds of Lungs.—The inferior posterior bounds of both lungs are just behind the junctions of the twelfth ribs to the vertebræ, and pass directly outwards and forwards.

Trachea.—The trachea (diagrams 7 and 13) at its bifurcation, as it lies to the right of and posterior to the arch of the aorta, is behind the right side of the sternum at its junction with the second right costal cartilage, and is behind and in front of (the œsophagus being interposed) the right side of the bodies of the fifth and sixth dorsal vertebræ. (Diagram 7.) Corresponding with this position of the trachea, the respiratory sounds, especially the expiratory murmurs, are louder and

4.—ORGANS HEALTHY.

BOY POULTER, AGED 9, DIED FROM FEVER.



1. Right lung; 1'. Left luug.—2. Lower boundary of the pericardial sac; 2'. Outline of the pericardial sac after it was distended by six ounces of water.—4. Vena cava.—7. Liver.—8. Stomach.—9. Spleen.—10–10. Kidneys.

Weight of Organs.—Heart, $3\frac{3}{4}$ ounces; right lung, $6\frac{1}{4}$ ditto; left lung, $5\frac{1}{2}$ ditto; liver, 23 ditto; spleen, 8 ditto; right kidney, 3 ditto; left kidney, $3\frac{1}{2}$ ditto.

Pericardium artificially distended; spleen large.

clearer to the right of the sternum and vertebræ, than to the left. (Diagram L.* 2.) In a healthy woman, the subject of this diagram, the expiratory murmur, which could not be heard to the left of the sternum, was perfectly clear to the right.

Heart; its Central Attachment.—The heart is attached to its place, in relative position to the lungs, by the veins supplying the left auricle; these veins issue from each lung at about an equal distance from the centre of the left auricle, which is in front of the sixth and seventh dorsal vertebræ. (Diagrams 7 and 13.)

The right auricle and the auricular portion of the right ventricle lie to the right of the centre of the sternum. As the auricle is not much exposed to variation in size, its encroachment on the right lung does not vary much during the motions of the heart; on the other hand, a greater part of the right, and the whole of the left ventricle, lie to the left of the centre of the sternum, so that these moving muscular cavities, varying constantly in size of cavity and solidity of walls, make a constantly varying encroachment on the mass of the left lung. (Diagrams 1, 2, 3, 4, 7, 11, &c.)

Right Bound.—The right bound of the heart, in other words the outer wall of the right auricle, is from one to two ribs breadths to the right of the right edge of the sternum. This bound varies considerably in different persons, the variation being due to the variation in quantity of blood in the right auricles; so that where the freedom of the

* The letter L. refers to a second series of diagrams taken from the living body.

circulation through the lungs permits the right ventricle, and, into it, the right auricle, to discharge their contents freely, this right bound approaches the right edge of the sternum. In those cases, on the other hand, where the circulation through the lungs is impeded, as generally happens towards the time of death, the right auricle and ventricle cannot freely discharge their contents, become filled, blocked up, and distended; the veins of the neck and the superior cava, the liver and the inferior cava, become greatly engorged; and the right bound of the heart encroaches much further on the right lung, and lies to the right of the sternum, almost as far as behind the costo-cartilaginous junctions. The vena cava superior, being the conduit to this auricle, is distended or relaxed at the same time with it, and its outer boundary is usually in the direction of the outer boundary of the auricle. Those portions of the heart that lie to the right of the centre of the sternum are always covered by a wedge of lung that thins off as it comes to the centre. By percussing with a firm, direct, deep stroke, the vibrations excited will pass quickly through the thin layer of lung and be stopped, damped by the deeper solid auricle, and will give a sound well contrasted with the reverberating resonance over the mass of the right lung. The tip of the right auricle lies generally a little to the left of the centre of the sternum; this point is on a line with the semilunar valves of the pulmonary artery, which are seated just to the left of the sternum, and is immediately in front of the first spring forward of the arch of the aorta,

a little to the right and in front of the semilunar valves, (diagrams 18, 20, and 25,) which are usually behind the left side of the sternum. (Diagram 1.)

Great Vessels.—The vena cava enters the auricle just to the right of the auricular portion, so that the spring of those great supplying vessels, the aorta and pulmonary artery, and the point of entrance of the vena cava, all lie together side by side, the aorta in the middle, flanked to the right by the vena cava, to the left by the pulmonary artery. The valve of the pulmonary artery is usually behind the sternal end of the second left intercostal space. (Diagrams 1, 2, 3, 4, and 5.)

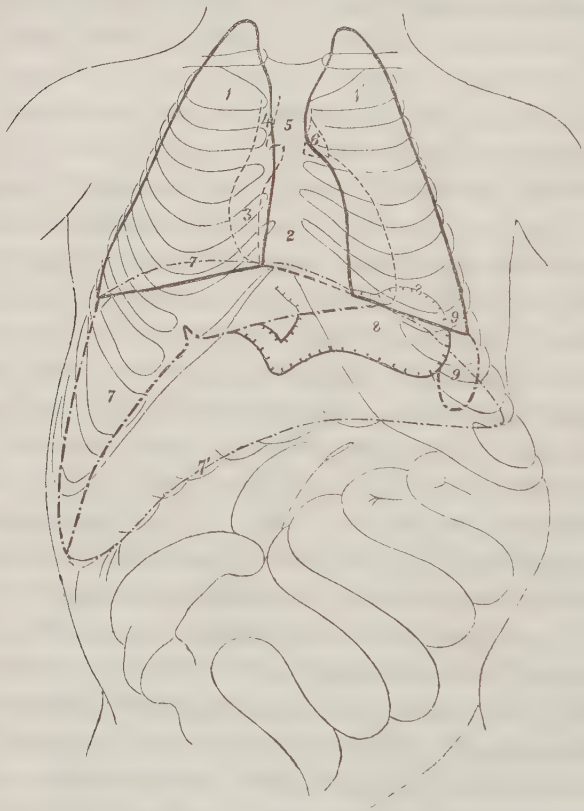
Aortic Valves.—The aortic valve is in general to the right of the third left costal cartilage, (diagrams 1 and 18,) but these parts do not maintain an unvarying position. They are influenced by the motions both of the heart and lungs. In cases of enlarged heart, where there are no adhesions, (diagrams 20 and 21,) in emphysema and in bronchitis, (diagrams 14 and 15,) the valves of the great vessels are lowered; the valve of the pulmonary artery being then seated immediately behind the third costal cartilage; and the aortic valve to the right of the fourth intercostal space, and the fourth left costal cartilage. These valves, on the other hand, are generally elevated in cases of enlargement of the heart, with pericardial adhesion. (Diagrams 22, 23, 24, and 25.) The aorta ascends a little to the left, and bulges forwards so as to approach the nearest to the sternum when on a line with the second costal cartilage. The pulmonary artery, on the other hand, is nearest to

the costal parietes, where it takes its rise; as it ascends to the lower extremity of the upper bone of the sternum, it passes gradually inwards and backwards. In cases of aortic regurgitation, where the flapping second sound of the aortic valves is replaced by a bellows noise, the second sound of the pulmonary artery is clearly heard over the second left intercostal space, just to the side of the sternum, but the sound is not heard over the upper part of the sternum.

Arch of Aorta.—The arch of the aorta, in its passage backwards and to the left, is behind the first bone of the sternum, and in front of the fourth dorsal vertebra; as it gives off the sub-clavian artery, it is anterior to the left half of the body of that vertebra; (diagram 7;) thence the aorta descends in front of the left half of the bodies of the dorsal vertebræ. The second sound of the aortic valves is well heard over the upper part of and above the sternum, in front of the great vessels; it is likewise heard with great clearness, though feebly in comparison with the points just named, over the third, fourth, and lower dorsal vertebræ, especially to the left of their spines. (Diagrams 1 and 2) If aortic regurgitation give rise to abnormal sounds, these are loudest and clearest over the usual seat of the replaced aortic second sound. The sounds of the aortic and pulmonic valves are, to some extent, muffled by the thin layers of lungs interposed between them and the sternum. In robust large-chested persons, and in females, where the upper part of the chest has been unnaturally developed by the influence of tight lacing, the

5.—ORGANS HEALTHY.

MARY BLIGHTON, AGED 4, DIED FROM THE EFFECTS OF A BURN.



1. Right lung; 1'. Left lung.—2. Heart.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—7'. Posterior deep boundary of the liver.—8. Stomach.—9. Spleen.

Weight of Organs.—Right lung, 3¾ ounces; left lung, 3 ditto; heart, 2¾ ditto; liver, 12 ditto; spleen, 2 ditto; right kidney, 1½ ditto; left kidney, 1¾ ditto.

Enormous flatulent distention, tilting upwards the anterior edge of the liver.

sounds of these valves over the sternum are comparatively indistinct.

Right Ventricle.—The right ventricle lies immediately behind the lower half of the sternum and the third, fourth, and fifth intercostal cartilages. Its junction with the right auricle takes a curve obliquely downwards and to the right, from the centre of the sternum between the third costal cartilages to the sternal junction of the sixth and seventh right costal cartilages. (Diagram 1.) The left boundary of this ventricle is defined by a line, drawn almost directly downwards, and to the left, from the outer edge of the pulmonary artery to the lower bound of the heart, a little to the right of the apex. Where the right ventricle is dilated, either by disease or by unusual distention, (diagrams 14 and 15,) this left boundary line, the ventricular septum, approaches close to the left bound of the heart; this boundary, on the other hand, is at an increased distance from that bound in those cases of enlarged left ventricle where the size of the right ventricle is normal. (Diagram 20.) The impulse of the right ventricle being naturally feeble in the healthy state, it is not communicated to the sternum; but where its walls are thickened, and its cavity enlarged, as in cases of pericardial adhesion, the impulse of the right ventricle being strong, heaves up the sternum. The to-and-fro friction sounds, so characteristic of pericarditis, are due to the systolic and diastolic glidings of the right ventricle on the free pericardum, when its surface is rendered turgid by enlarged blood vessels, or roughened by new vascular deposit.

Tricuspid Valve.—The tricuspid valve (diagrams 1 and 3) passes from the right auriculo-ventricular junction, and lies immediately behind the centre of the sternum, where the abnormal sounds due to regurgitation through this valve are loud and clear.

Left Ventricle.—The left ventricle usually projects an inch beyond the right. (Diagram 1.) The outer bound is usually behind the nipple. Its apex is behind the lower edge of the fifth rib, (diagram 1,) close to the costal cartilage. The apex of the heart is, after death, almost always drawn upwards for about half a rib's breadth. In enlargement of the heart, (diagrams 20 and 21,) the outer bound of this ventricle is considerably more to the left, and the apex is much lower than in the state of health. This deep outer bound of the left ventricle is readily ascertained by strong deep percussion. (Diagrams L, 1, 2, &c.) The posterior surface of the left auriculo-ventricular junction is to the left of the transverse processes of the sixth, seventh, and eighth dorsal vertebræ. (Diagram 7.)

Mitral Valve.—In front, the broad attachment of the mitral valve is immediately behind the centre of the sternum, posterior to the tricuspid valves. The columnæ carneæ, as they approach the apex, lie behind the fourth and fifth costal cartilages; but it is at their origin at the apex that they come the closest to the surface, and it is there that conveyed abnormal sounds, due to mitral regurgitation, are most distinctly heard; these sounds are likewise heard, though very faintly, to the left of the seventh and eighth dorsal vertebræ. As the aorta is there interposed between the vertebræ and the heart, the

aortic valvular sounds are carried by the current of blood to this point. If the abnormal sound there heard be louder over the third and fourth dorsal vertebræ, it is due to disease of the aortic valves; but if the sound become louder on approaching the heart's apex, and is not heard behind the upper dorsal vertebræ, it is due to mitral regurgitation. The healthy first or systolic sound begins with a sharp, clacking, often ringing noise, perfectly alike in character to the second sound; this sharp sound is heard exactly at the same time that the shock of the impulse is felt; it is loud in the neighbourhood of that shock, and over the whole region of the heart's dulness, but is indistinct and feeble wherever any portion of lung is interposed between the heart and parietes. (Diagrams L. 1, and 2.) The sharp noise is followed by a dull rumble, which is usually heard over a very great extent, and especially where the chest is narrow and its walls thin. The lower bound of the heart extends from the lowest point of auriculo-ventricular junction to the apex, with a gentle obliquity downwards and to the left; it usually passes behind the articulation of the xyphoid cartilage to the sternum. If the liver does not extend to the left of the apex, the hollow resonance of the stomach affords a marked contrast to the dull sound of the heart; and as firm percussion over the lower and left margin of the liver usually brings out the resonance of the deep stomach, we can almost always ascertain the heart's lower boundary. This boundary almost invariably extends from the inner edge of the lower margin of the right lung, which is usually just under the extremity of

the sternum to the inner edge of the lower margin of the left lung, which is a little to the right of the heart's apex. Ascertain these points, draw a line from one to the other, and you will define the lower bound of the heart with just precision. In life-time the lower bound of the heart is usually about half a a rib's breadth higher than it is after death. On making an examination of the dead body, the lower bound of the pericardial sac, (diagrams 3, 19, &c.,) is found to be lower than the heart's lower bound, as the heart, after the last vital contraction, contains less blood than it does during life, and retracts upwards.

Arteria Innominata.—The arteria innominata is in front of the trachea, just above the sternum; (diagram 11, &c.;) its beat is not usually seen, but it is visible in cases of aortic regurgitation, where the vessel rises with a rapid bound and falls back with a sudden jerk; and it is also seen where the artery is unusually distended, as in cases where there is an undue and over-abundant supply of arterial blood to the head. Besides this arterial pulse that is occasionally seen in the neck, we have another, a venous pulsation, that is almost invariably visible.

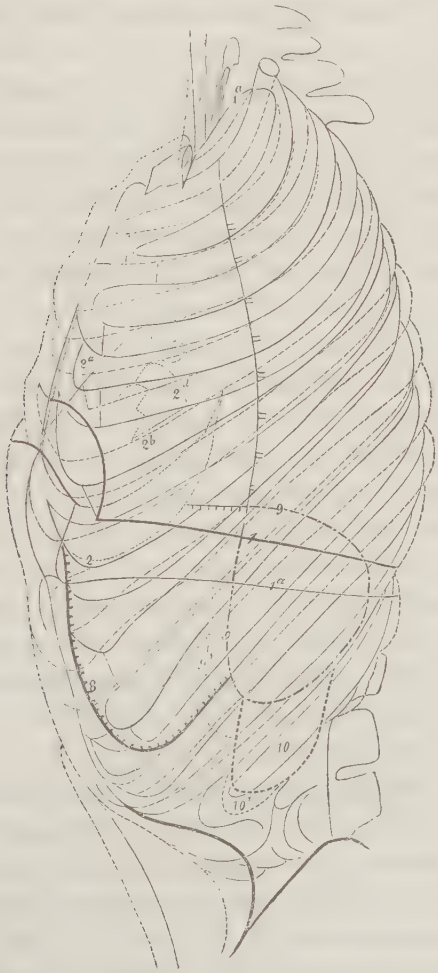
Jugular Pulsation.—The deep jugular veins lie beneath the sterno-cleido muscles, when joined by the subclavian veins they pass into the chest just behind the junction of the sternum and clavicle. (Diagrams 15 and 20.) There is a constant visible pulsation, both in these and in the superficial jugular veins, which pulsation, though perfectly visible, cannot be felt. The veins are *most distended*

6.—HEALTHY ORGANS—(Side View.)

Showing also the change in form of the Costal Wall that effects a deep Inspiration.

John Egan, aged 23,

Patient of Mr. White; Ulcers of Intestines and Leg.



1. Left lung; 1*a*. Left lung after being fully inflated.—2. Lower boundary of the pericardium; 2*a*. Right ventricle; 2*b*. Left ventricle; 2*d*. Mitral valve.—8. Stomach.—9. Spleen; 9'. Situation of spleen after the lungs were inflated.—10. Kidney; 10'. Kidney, after inflation of the lungs.

The *continuous lines* indicate the seat and form of the ribs and scaleni *before* the lungs were inflated. The *interrupted lines* indicate the seat of the ribs and scaleni *after* the lungs were inflated.

during the *systole,* when the blood is sent with the greatest energy by the contraction of the ventricles through the arteries and capillaries along the veins. At the same time, the contraction of the right ventricle prevents its reservoir, the right auricle, from discharging itself, so that the auricle and the con. duits leading to it, the veins, become distended. Immediately after the ventricular contraction the cavity of the right ventricle becomes *flaccid,* the contents of the veins are forced onwards into the auricle by the contraction of the arteries previously distended during the systole; and from the auricle by the same action, the blood is poured into the right ventricle. The obstruction to the progress of the venous blood is now removed, and during the *second sound* the veins become comparatively *empty,* a slight rally instantly takes place, the veins *swell,* but to a very slight degree; the *second swelling* is instantly followed by a *second,* though a very slight *depression,* after which, a gradual swell takes place; this swell continues during the whole of the interval, and suddenly increases during the systole. The second slight pulsation is like a gentle rapid dance upon the surface of the vein.

Effect of Respiration on Jugular Pulsation.—The veins of the neck contain the least blood during a deep inspiration, the expansion of the walls of the chest withdraws the pressure of those walls from the right cavities of the heart, and permits the blood to be sent more freely into those cavities. The venous pulsation is much diminished, in many persons rendered invisible, during a deep inspiration. A forcible and deep expiration has, on the

other hand, quite an opposite effect; the contracted walls of the chest compress the right cavities of the heart, and prevent the ingress of venous blood. The veins of the neck and of the thyroid body become necessarily distended; these veins indeed become an ever-varying reservoir, that adapts itself with perfect flexibility to the expansion or contraction of the heart, so that, when the cavity inside is lessened, the reservoir outside is enlarged. During the deep expiration, provided the swelling of the veins be not extreme, the venous pulsation is increased: if the veins become completely distended, pulsation cannot, does not take place; the constant full distension does not admit of variation. The venous pulsation is readily distinguished in the recumbent posture during ordinary inspiration. Each inspiration lessens the quantity of blood in the veins, each expiration increases it; so that here, in the act of respiration, we have a cause for another venous pulsation wave. The mere existence of jugular pulsation is anything but an indication of disease, either in the pulmonary valves or elsewhere. In those diseases where the flow of blood through the lungs and heart is impeded, the jugular veins contain more blood, and their pulsations are more visible than in health; but where the impediment is extreme the veins are in a state of constant distention, and no pulsation is visible. If, on the other hand, the circulation be feeble and there is no resistance to the emptying of the venous blood into the heart, then the veins contain very little blood, and the venous pulsation is very slight, scarcely to be perceived.

Diaphragm, Right Side.—The diaphragm on the right side, bulged up by the liver, usually rises into the chest as high as the fourth intercostal space; (diagrams 1 and 2;) it often reaches up to the fourth rib; (diagrams 4 and 11;) but in children (diagram 5) it only attains to the fifth. When the liver is very greatly enlarged, the diaphragm bulges still higher. (Diagram 10, where the upper boundary of the liver is behind the third rib.)

Left Side.—On the left side, the diaphragm, and with it the stomach and spleen, usually rises as high as the fifth rib. (Diagrams 1, 4, and 11.) Where the stomach is very empty, as in diagrams 2 and 8, the diaphragm does not rise so high. The central tendon of the diaphragm is, in front, usually behind the upper portion of the xyphoid cartilage; its posterior and upper bound is generally a rib's breadth higher. Posteriorly, the upper bound of the diaphragm is immediately in front of the eighth right rib, and the eighth and ninth left ribs. (Diagrams 6 and 7.) The position of the base of each lung, and of the lower surface of the heart, is governed by the situation of the diaphragm. The heart rests on the inclined slope of its central tendon, and each lung on the convex upper surface of its muscular walls. As the inferior margin of each lung is from two to three ribs' breadths lower than the summit of the diaphragmatic bulge, there is a thin layer of lung interposed between the convex surface of that bulge and the costal parietes, extending on the right side of the chest, from the sternum to the vertebræ, and on the left side, from the front of the apex of the heart to the vertebræ.

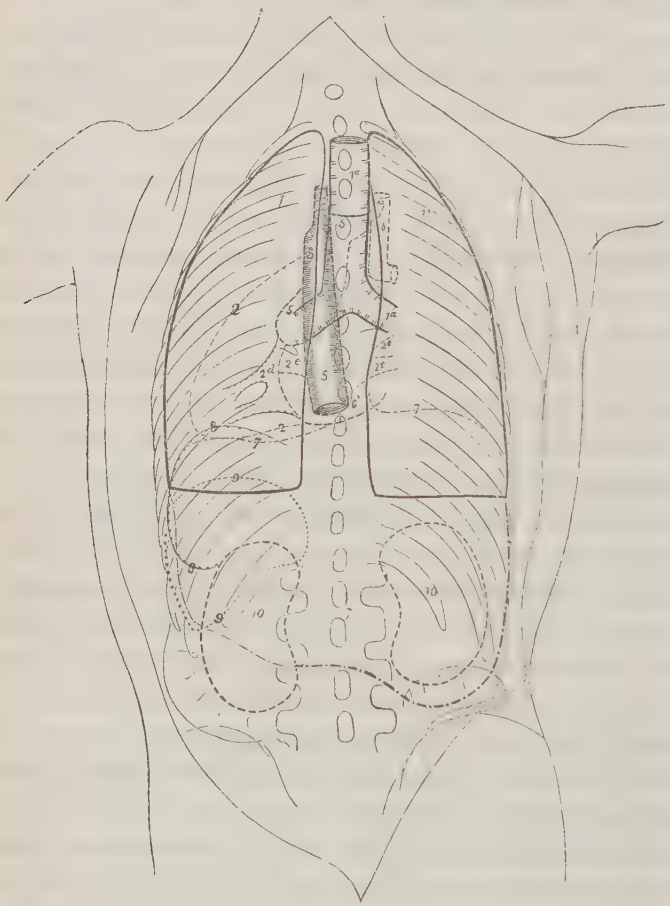
As the lower margins of the lungs descend more behind than in front, there is a greater portion of thinned lung posteriorly than anteriorly.

The upper bound of the liver can be readily ascertained, both in front and behind, by the contrast between the deep resonant sound of the lung and the deep dull sound of the liver, as elicited by strong deep percussion. (Diagram L, 1.) On percussing strongly on the left side, over the thin layer of lung, the hollow sound of the deeper stomach is brought out; this upper boundary of the stomach cannot be ascertained so accurately as that of the liver; but the general bearings may be pretty well made out, especially towards the posterior part of the chest, where the spleen is immediately in front of the thin layer of lung, and where deep percussion produces a damped sound. As there is not so great a mass of spleen as of liver, and as the hollow resounding stomach is immediately in front of that organ, the upper bounds of the diaphragm over the left side can nowhere be ascertained with the same accuracy as it may over the right. As the heart occupies a great portion of the left side of the chest, that deep resonance, which strong percussion over the body of the right lung elicits, cannot be so fully produced over the body of the left. The lower bounds of the liver are by no means so fixed as the upper; they indeed vary exceedingly; the rise of the lower margin of the liver varies much in different persons, and in the same persons at different periods. The constantly varying distention of the stomach and bowels alters the position of the mass of the liver. The stomach at its cardiac and

7.—HEALTHY THORACIC ORGANS—(Posterior View.)

Thomas Moss, aged 60,

Patient of Dr. Hutchinson; Jaundice and Diseased Liver.



1. Right lung; 1'. Left lung; 1*a*. Trachea.—2. Left ventricle; 2*d*. Mitral valve; 2*e*. Pulmonary veins.—5. Aorta.—6'. Left auricle.—7. Liver.—8. Stomach.—9. Spleen.—10–10. Kidneys.

Weight of Organs.—Heart, 12 ounces; right lung, 13 ditto; left lung, 12 ditto; liver, 60 ditto; spleen, 9½ ditto; kidneys each, 7 ditto.

Liver and spleen enlarged.

pyloric extremities, and the liver, are anatomically united. The motions of one organ invariably affect those of the other. When the stomach is moderately distended, the liver extends to the left about half way between the xyphoid cartilage and the apex of the heart. The liver extends much further to the left in children, whose liver is always relatively large, (diagrams 4 and 6,) and in women, whose liver is pushed to the left and downwards, through the influence of tight lacing. On the other hand, when the stomach is empty, as in diagrams 2 and 21, the liver falls over into the space that was previously occupied by the stomach, carrying with it its lower and left margins. The lower margin of the liver (diagram 1) passes from its left extremity obliquely downwards to the lowest edge of the right costal cartilages; this right extremity of the lower margin is usually in adult males above, in women and children below that edge. The lower margin of the liver is usually from two to four inches below the extremity of the sternum. In cases of enlarged liver, (diagram 10, and for a posterior view diagram 7,) these boundaries extend farther to the left and descend lower into the abdomen.

Stomach.—The position of the outer boundary of the greater curvature of the stomach depends upon the quantity of gas and food it contains; it is sometimes perfectly empty, (diagrams 2 and 21,) when the outer bound is some inches from the outside of the ribs; in some it is moderately, in others, again, enormously distended, (diagram 1,) where it presses against the ribs, just within the left side. The lower bound of the stomach varies with its

own distension, and with the lower bound of the liver. Where the liver descends low, (diagrams 8, 10, and 21,) it draws down with it the pyloric extremity of the stomach and the lower limb of the greater curvature. The lesser curvature lies immediately behind the liver; the cardiac orifice is just behind the xyphoid cartilage. The division of the stomach into cardiac and pyloric portions, by an hour-glass contraction, is well shown in diagrams 14, 20, and 23. The pyloric portion of the stomach is generally found empty: a curious example of this is presented in diagram 15; its usual state is shown in diagram 21, and many others. The liver at its lower edge thins off; the dull sound of the liver and the resonance of the stomach are well contrasted; but to ascertain the precise bound of the liver the percussion must be very light, otherwise the sound will pass through its marginal film and excite stomach vibrations. The ease with which stomach vibrations are excited by deep, strong percussion, through the thinned marginal part of the liver, affords an excellent criterion to distinguish the lower boundary of the heart, when the left edge of the liver stretches beyond that organ.

The upper part of the stomach lies behind the lower portion and apex of the heart. (Diagram 1, &c.) In cases of pyrosis, heart-burn, and other painful affections of the stomach, the pain is usually referred to the heart.

Influence of a Full Meal on the Liver, Heart, and Lungs, in Dyspepsia.—In many persons a hearty or indigestible meal is soon followed by pain in the region of the stomach, a sense of præcordial weight,

palpitation, and dyspnœa. The pain, though referred to the heart, is seated in the stomach, which, being greatly distended, presses the lower surface of the liver upwards against the diaphragm, compresses the whole organ, and doubtless pushes the blood from the hepatic veins into the right auricle. At the same time that the heart is thus overcharged, that organ is itself pressed upwards, along with the diaphragm, by the stomach. The action of the lungs is likewise interfered with, the diaphragm being pushed up and its descent impeded. Can we wonder that, in these circumstances, the striving of the heart to throw off its blood, and the efforts of the clogged lungs to arterialize the increased quantity of blood, should give rise to palpitation, and to difficult and hurried breathing.

Enlarged Liver.—Persons affected with enlarged liver, due either to temporary engorgement or disease, suffer from præcordial oppression or palpitation when they lie on the left side, as the weight of the liver presses directly upon the heart, impedes its action, and rouses it to unusual efforts. (Diagram 10.)

Mutual Adjustments of Liver and Stomach.—The adjustments of the liver and stomach are so nicely, so intricately dovetailed, that affection in one organ usually involves the other. The known existence of enlarged liver ought not to divert our attention from, but direct it to, the state of the heart and lungs; for although diseases in those organs are but rarely the result of affection of the liver, yet hepatic enlargement is a usual attendant on diseases of the heart and lungs. (Diagrams 16 and 18, cases

of phthisis; 15, bronchitis; 20, 23, and 25, diseased heart.)

Spleen.—The spleen is immediately behind and to the left of the upper portion of the greater curvature of the stomach, and in front of the upper, outer, and back part of the left hollow of the diaphragm. It sometimes rises as high as the upper boundary of the stomach; (diagrams 2, 16, 24, and 25;) but it is usually from half a rib to a rib's breadth lower. (Diagrams 4, 5, 7, and 17.) The upper bound is usually behind the fifth rib or fifth intercostal space, and in front of the tenth rib. (For posterior views see diagrams 7 and 13; and for a lateral view see diagram 6.) The lower boundary usually lies behind the seventh rib, if the organ be of moderate size; (diagrams 2, 16, and 24;) but where it is large it is behind or even below the lowest edge of the costal cartilages. (Diagrams 4 and 18.) The inner and lower boundary of the spleen lies in front of the upper part of the left kidney.

Enlarged Spleen.—In enlargement of the spleen its upper boundary rises so as to encroach on the heart and lungs. When inflammation affects the pericardium over the central tendon, and the pleura over the left bulge of the diaphragm, it usually involves the peritonæum lining the under side of the diaphragm, and that investing the spleen. When the inflammation ends in pericardial and pleuritic adhesions the spleen is usually matted, as well as the heart and lungs, to the diaphragm, as in diagrams 23 and 24. The upper portion of the spleen is separated from the walls of the chest, posteriorly, by a thin portion of lung.

Percussion over the Spleen.—Light percussion over the upper portion of the spleen brings out the shallow resonance of the superficial lung, while firm percussion is damped and deadened by the deeper solid spleen; the upper boundary of the spleen, which can be thus ascertained, cannot be traced so accurately as the upper boundary of the liver, as vibrations are easily excited in the stomach and alter the nature of the tone. The contrast between the dulness of the spleen and the resonance of the stomach renders it easy to define the outer border. The spleen, like the liver, is compressed by the stomach when distended.

Pancreas.—The position of the pancreas is shown in diagrams 15 and 16.

Kidneys.—The right kidney is usually about half a rib's breadth lower than the left, (diagrams 10, 13, 21, &c.,) that kidney being pushed downwards by the liver. Where the spleen is enlarged, or the lower lobe of the left lung is affected with pneumonia, the left kidney is displaced downwards, and lies as low as, sometimes lower than, the right. The upper border of each kidney is immediately in front of the eleventh and twelfth ribs, the diaphragm interposed, being behind the liver on the right side, the spleen on the left.

Percussion over the Kidneys.—The upper boundaries of the kidneys cannot be ascertained by percussion, as they lie immediately behind and below the equally solid liver and spleen; (diagrams 7 and 13;) but their outer and lower boundaries can be discovered by strong deep percussion, as the dead sound excited over the kidney is well con-

trasted with the hollow sound produced over the adjoining intestines.

The Intestines.—The space occupied in the cavity of the abdomen by the intestines varies exceedingly. They are sometimes shrivelled up into a mere corner, as in the strangely emaciated figure, diagram 8, while in others they enormously distend the abdomen and push up the liver, spleen, and diaphragm: in some the colon is the seat of this distension; (diagrams 15 and 20;) in others the small intestines; (diagram 19;) in others, again, there is combined distension of stomach, colon, and small intestines. (Diagram 1.)

When the Intestines are empty, the Diaphragm is low.—Where the intestines are unusually empty, as in the subject represented in diagram 8, a poor woman, in whom malignant disease of the œsophagus prevented deglutition, the liver, spleen, stomach, kidneys, and diaphragm, are all unusually low; and, consequently, the bases of the lungs and the lower surface of the heart are dragged down.

When they are distended, the Diaphragm is pushed up.—In cases of abdominal distension, on the other hand, the diaphragm is pushed upwards, and the lungs and heart, resting on it as on a floor, are necessarily raised.

Effusion of Air into the Peritoneal Cavity.—When the bowel is perforated, the effusion of air into the peritoneal cavity causes enormous ballooning; the liver, stomach, and diaphragm are pushed up to a very great extent; see diagram 9, where the right bulge of the diaphragm is behind the third, the left behind the fourth inter-

8.—DIAPHRAGM AND ORGANS OF CHEST LOWERED BY EMPTINESS OF STOMACH AND INTESTINES.

SARAH SKEVINGTON, AGED 61, PATIENT OF MR. WHITE; MALIGNANT DISEASE OF ŒSOPHAGUS; PREVENTING DEGLUTITION.

1. Right Lung; 1'. Left Lung.—2. Ventricles.—3. Right auricle.—5. Aorta. 6. Pulmonary artery.—7. Liver.—8. Stomach.—9. Spleen.—10–10. Kidneys.

costal space, and where the lower margin of the right lung descends but little below the fourth rib. Contrast this with diagram 8, where the perfect vacuity of the abdomen has so drawn down the diaphragm, that its right bulge is almost below the fifth intercostal space, its left is behind the sixth rib, and the lower margin of the right lung behind the sixth intercostal space.

Ascites.—In ascites (diagram L. 3) the diaphragm and, consequently, the base of the lungs and lower surface of the heart are pushed up to a greater extent than in effusion of air into the peritoneal cavity, the effused fluid increases slowly, and the diaphragm, the ribs, the parietes, and all the organs, gradually adapt themselves to its presence. In one man, whose abdomen contained several gallons of fluid, the lower margin of the right lung was behind the fourth rib; after the fluid was withdrawn it was behind the fifth intercostal space. The lower bound of the heart descended in like manner.

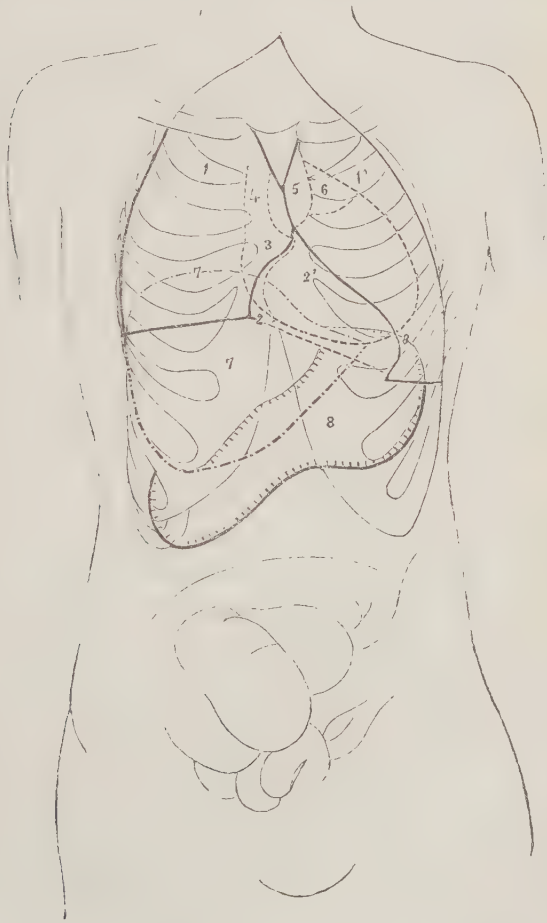
Ovarian Dropsy.—Ovarian dropsy occasions a similar displacement upwards of the diaphragm, but seldom to the same extent.

Pregnancy.—In pregnancy the skin of the lower part of the abdomen becomes distended, in like proportion with the distension of the gravid uterus; the enlarged organ, instead of pushing upwards the liver, spleen, stomach, and diaphragm, falls forward, displaces the skin, and permits the diaphragm to retain pretty nearly its usual elevation.

The Circulation and Respiration are impeded by Abdominal Distension.—The terrible anxiety,

9.—DIAPHRAGM AND ORGANS OF CHEST RAISED BY ABDOMINAL DISTENSION, FROM EFFUSION OF AIR INTO THE PERITONEAL CAVITY.

ELIZABETH HUTCHINSON, AGED 16,
PATIENT OF MR. WRIGHT; RUPTURE OF APPENDIX VERMIFORMIS.



1. Right Lung; 1'. Left lung.—2. Lower boundary of pericardial sac; 2'. Ventricles.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.

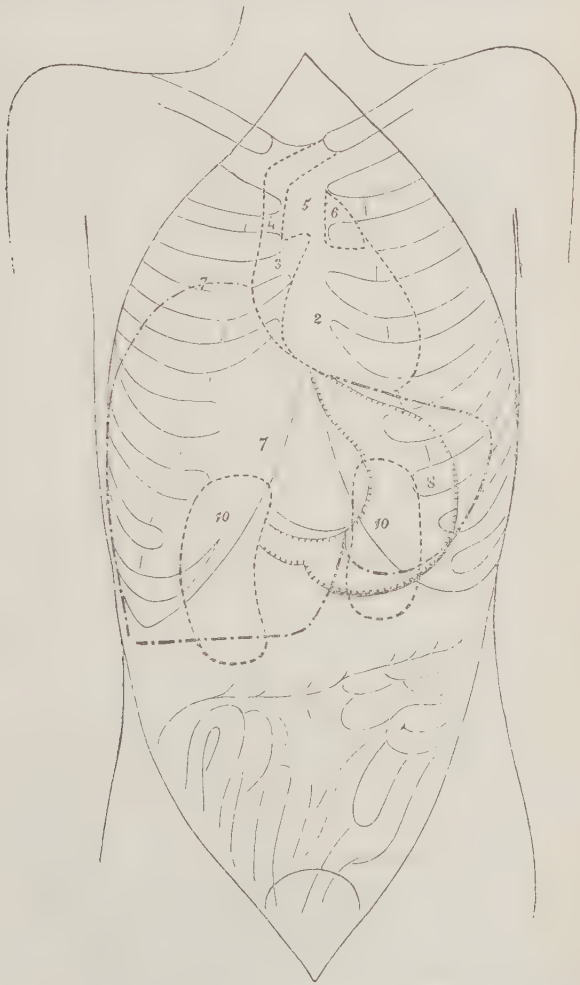
dyspnœa, and interruption to the circulation, existing in cases of puerperal peritonitis, effusion of air or fluid into the abdomen, or of great distension of the intestines, is in great measure due to the thrusting upwards of the circulating and breathing apparatus, and to the fixing of the diaphragm, which is thus disabled from relieving those organs. In tabid children, whose intestines, vastly distended, protrude the abdomen on all sides, push up the diaphragm, and narrow the space for the heart and lungs, the dyspnœa and the most deadly symptoms are owing, not so much to the immediate disease in the abdomen, as to the clogging of the movements of the heart and lungs, due to that disease. There are few points in practical medicine of more importance than this—to remove or prevent flatulent distension of the abdomen.

ON RESPIRATION.

On Inspiration, the Chest enlarges at every point.—In the act of breathing, the cavity of the chest containing the lungs and heart is everywhere enlarged, the domed roof rises, the bulging floor descends and becomes flatter; and the walls on all sides form the enlarging boundaries of an increasing area. Every arch in this everywhere arched cavity is increased in space. Let us put it to the Wattses, the Brunels, the Stephensons, the masters of inventive mechanism, to make a cavity with solid walls, which cavity shall in every point be enlarged or lessened at once and at will, and strain their faculties as they may, they will be foiled; yes, foiled entirely, although at no previous time

10.—DIAPHRAGM (RIGHT BULGE) AND RIGHT LUNG PUSHED UP BY ABSCESS IN LIVER.

WILLIAM BARLOW, AGED 16; HEPATIC ABSCESS FOLLOWING FEVER.



2. Ventricles.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.—10–10. Kidneys.

Weight of Organs.—Heart, 7½ ounces; right lung, 18½ ditto; left lung, 17½ ditto; liver, 69 ditto, besides about three pints of pus; spleen, 6½ ditto; right kidney, 5 ditto; left kidney, 6 ditto.

in the world's history has the invention of man unfolded so rapidly the evergrowing powers of mechanism. With all this invention, no mechanism of human contrivance is equal to that which effects respiration. The steam-engine, mighty as it is in disembowelling the earth, emptying lakes, linking the world into one country, this kingdom into one city, and eating up one by one mechanical arts that once gave work and food to man, still its cylinder is but a simple tube, its piston has a straightforward motion.

But let us lay aside the works of man, and look far and wide into creation, and nowhere, I believe, shall we find such admirable adjustment as in the breathing machine. It has the first rank amongst the first order of constructed things; creation has here worked out a scheme no less than life itself. Arrest the play of breathing and the blood clogs in its vessels, the heart ceases to beat, feeling is no more, and the busy brain is at rest for ever. Insert the wourali poison into the flesh of an animal, and in a few minutes all feeling has fled, the play of the lungs has ceased, the heart is about to beat for the last time. Fill those lungs with the air we breathe—fill them again and again—the heart that could scarce move now pours its blood through its vessels; go on with this artificial breathing for hours, and at length the still nostrils dilate, the loose limbs quiver, the dimmed eyes brighten, the animal now breathes, and the almost dead is alive again.

As life hinges on breathing, so the degree, the energy, the vigour of life, are ruled by the capacity,

the vigour, the play of the breathing apparatus. The savage, powerful lion has lungs capacious and free playing; the still, grazing cow, heavy in frame, slow in movement, has lungs small in compass, and narrow in range of action. The free-born hunter has a wiry erect frame, a firm limb, an elastic glistening skin; his lungs are large, their play varied and ample. The cooped-up, stooping, pale mechanic, emaciated, feeble, of sickly hue, has scanty lungs, which are easily charged to the full; under labour he soon sinks exhausted and breathless. The strength, vigour, and elasticity of man, is in proportion to the extent and range of the lungs. Every man has much more lung than he requires in the quiet pursuits of life; he requires less when he lies down, sleeps, or is depressed; but more when he walks, runs, wrestles, or is roused by passion. The lung that is used is an ever-varying quantity. Another perfection in this mechanism is, that just as much lung is used as the listlessness or vigour of the moment requires; there is every range, every variety, until the top of the wind, the top of the speed, is reached.

The Lungs' capacity may be increased by Training.—The more the lungs are used, the more is their capacity nursed. The man that under one training is the feeble, narrow-chested, sickly mechanic, is under another the active, full-chested, and healthy sailor. The bloated, ill-skinned, short-winded sot, may, in a few weeks, be changed by training to the firm-fleshed, clear-skinned, long-winded prize fighter. The physician has within his compass the power to train the sickly and short-breathed, in like

manner, up to health and wind. This change is effected by the development, the gradual nursing, of the breathing powers.

The heart as well as the lungs is moved by each motion of the chest; the respiration and circulation are to each other essential; they are one, they are the members of one system; nurse one you nurse the other; in giving tone and health to one you give tone and health to both.

Modes of exciting Respiration and Circulation.—The seat of almost all the feeling nerves, the skin; that exciter of the first act of breathing, that stimulator, with its continuous internal skin, the stomach, to all the following acts, is the great mean through which the physician can affect the lungs, the heart, the life. Free exposure, with exertion, stimulates the skin, enlarges its capillary vessels, either by a direct impression, by a reflected action, or by an action transmitted from the mind; and with the same or even less pumping force, the heart sends infinitely more blood to the surface. The blood circulates faster, the same quantity doing more work; the breathing is quicker, fuller, excited by the skin through a reflected action: the circulation active, the respiration must be active; if one stops, the other stops; if one is torpid, the other is torpid; if one is energetic, the other is energetic.

Of depressing Respiration and Circulation.—Cold, on the other hand, when the frame is torpid, contracts the skin and its capillary vessels—they become shrivelled, almost bloodless. The same or even greater pumping force from the heart cannot send a tithe of the blood through the clogged

vessels; just as 100 men, with all their force, cannot pump so much water through the fire-engine's hose when almost tied up, as ten men with moderate labour can if that hose be wide open. The blood circulating in less quantity, the breathing is less full, the life is less active.

MECHANISM AND MOVEMENTS EFFECTING INSPIRATION.

(DIAGRAMS 6, 11, 12, 13, & L. 1. 2.)

The First Ribs rise, protrude forwards, and to the side.—The sternal ends of the first ribs are gradually raised, during the whole time of inspiration, by the anterior scaleni; at the same time the posterior scaleni draw upwards the outer curves of these ribs. The slant of the ribs both from behind, forwards, and from the centre to the outside, is lessened, the ribs approach more to a right angle, the front or sternal end is pushed forward and lengthened, and the side curves are increased in area.

The first ribs raise and push forward the Sternum.—The first ribs being fixed to the sternum by a scarcely yielding cartilage, the raising and pushing forward of the ends of the first ribs raises and pushes forward the sternum fixed to those ends, increases the distance between the sternum and the vertebræ, raises the outlet of the chest, and increases the area of that outlet.

The Sternum draws after it all the fixed Ribs.—When the sternum is raised, all the ribs joined to it and those attached to the sternal ribs are necessarily drawn after it and raised also.

The Second Rib rises and projects.—The second rib, besides being raised at its sternal end by the sternum, is drawn upwards by the levator costæ, the external intercostal, the scalenus posticus, and the serratus posticus superior. The combined action of these muscles raises and brings nearer to the first rib the outer curve and the sternal end of the second rib, lessens its obliquity from centre to side, and from behind forward, and protrudes its outer curve and sternal end. The external intercostal muscle between the first and second costal cartilages raises the second costal cartilage, increases the distance of its costal end from the sternum, and brings the whole cartilage nearer the first rib. The obtuse angle or concave curve looking upwards, formed between the cartilage and rib, becomes a straight line.

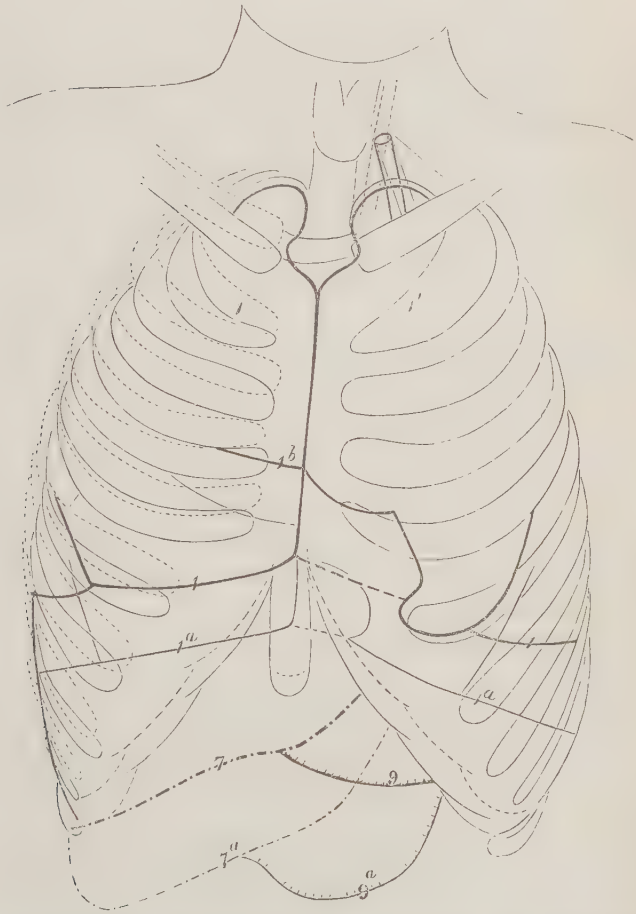
The second ribs raise and push forward the Sternum.—The sternum, in addition to its protrusion and elevation by the motion of the first ribs, is still farther pushed forward and raised, at the junction of its first and second bones, by the forward movement of the sternal end of the second ribs through the medium of their cartilages. The cartilages yield a little and do not draw forward the sternum so far as they are pushed forward.

The entire area of the chest behind the sternum and second costal cartilages, and within the second ribs, is increased.

Third, Fourth, and Fifth Ribs.—The third, fourth, and fifth ribs are moved by the same muscles, less the scalenus, and are drawn upwards in the same manner as the second rib. The sternal end and the

11.—EFFECTS OF ARTIFICIAL RESPIRATION ON THE POSITION OF THE RIBS AND INTERNAL ORGANS.

ALFRED DUKE, AGED 36,
PATIENT OF MR. WHITE; COMPOUND FRACTURE OF BOTH LEGS.



1. Inferior margins of the lungs *before* they were inflated; 1*a*. Inferior margins of the lungs *after* they were inflated to the full.—7. Position of the liver *before* the lungs were inflated; 7*a*. Position of liver *after* the lungs were inflated.—9. Position of stomach *before* the lungs were inflated; 9 *a*. Position of stomach *after* the lungs were inflated.

The pleural scalenus and its motion on inspiration is shown to the left of the trachea.

outer curve of each rib are raised, and they are respectively thrust forward and outward. The external intercostals raise the third, fourth, and fifth ribs, and bring them nearer to each other.

The upper edge of each rib slides backwards in relation to the lower edge of the rib above, after the fashion of the motion of the parallel ruler blades on each other. These ribs are thus moved on each other by the fibres of the external intercostal muscles which descend obliquely forwards, and on their contraction bring their insertion in the lower rib more nearly under their origin from the upper rib.

Forward Movement of the Cartilages.—The cartilaginous portions of these ribs are raised and brought nearer to each other by the contraction of the sternal and intercartilaginous portions of the deep intercostal muscles. Their angles with the sternum become less obtuse, their curves are lessened, and their costal ends rise and become more distant from the sternum.

The cartilaginous ends of the ribs raise and push forward the costal ends of the cartilages.

The sternum, being attached to the cartilages, is drawn forward by their combined advance, but not to the same extent that they are pushed forward; as the cartilages yield, the centre becomes more prominent than either their sternal or costal ends. The prominence thus formed, or increased, at each side of the sternum, increases the space for the lungs and heart behind the prominence.

The combined action of the five superior ribs and their cartilages, and the sternum, elevates and

enlarges the dome of the chest, and expands its walls forwards and at the sides.

The Summit of the Lungs.—The summit of each lung is expanded forwards and to the sides by the forward movement of the scalenus anticus, by the lateral outward movement of the scalenus posticus, and by the general enlargement of the area of the brim of the chest, due to the movements of the first ribs. The costal pleura is strengthened by a tendinous fascia, formed by the insertion of the pleural scalenus, which fascia is attached to the whole circuit of the inner edge of the first rib.

Pleural Scalenus.—By the contraction of the pleural scalenus the fascia is raised, and along with it the pleura. In the subject from which diagram 6 was taken, a strong set of muscular fibres arose from the inner edge of the first rib, close to its articulation, passed directly forward, became tendinous and aponeurotic, and was joined by the tendinous aponeurosis of the pleural scalenus. The muscle in question may, in this subject, be described as having two heads, one of which arises from the transverse process of the last cervical vertebra, and the other from the first rib. The costal head renders tense the pleural fascia, and the vertebral head raises up this fascia at the centre, thus giving it a funnel shape.

The first, second, and third ribs are raised by muscles that act from points within the upper edges of those ribs; the inspiratory contraction of those muscles renders the obliquity of the inner surface of those ribs more horizontal, thus raising and amplifying the dome of the chest. The posterior

curves of the ribs just spoken of move forward, the posterior angle of the fourth rib is stationary, whilst that of the fifth moves backwards.

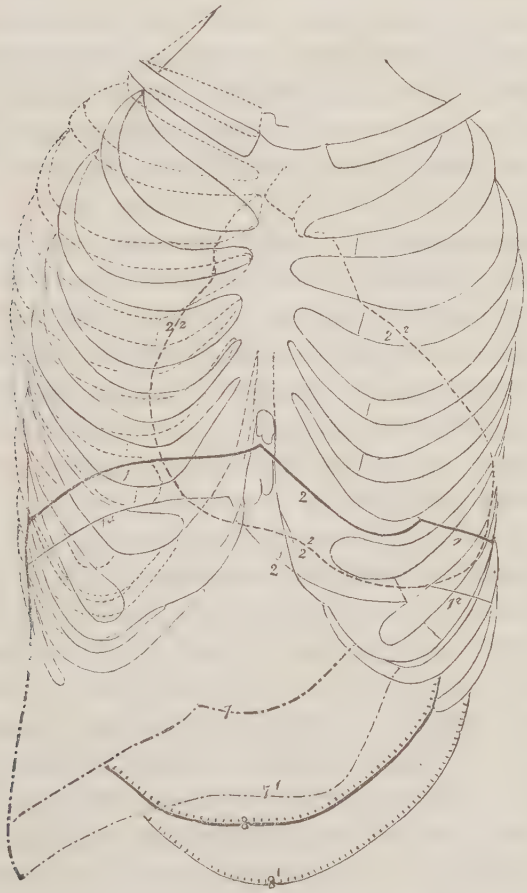
Posteriorly, the first five ribs recede from each other; laterally they are stationary; and anteriorly, they, as well as their respective costal cartilages, approach each other.

The Upper Lobes of the Lungs are expanded forwards, upwards, and to the side.—The general effect of the movements of the first, second, third, fourth, and fifth ribs is, to raise the sternum, to push forward the costal cartilages and ribs, to remove further from one another the lateral concavity formed by the ribs on each side, and to draw forward the posterior wall of the deep hollow formed by the ribs to the side of the spinal column. The cavity is increased at every point upwards and forwards, and the superior portions of the lungs are expanded in these directions.

Movements of the Sixth, Seventh, and Eighth Ribs.—The sixth, seventh, and eighth ribs, which are linked together by their conjoint costal cartilages, are raised by the levatores costarum, by the fifth external intercostal muscle, and by the upward movement of the sternum. The posterior angles of these ribs are drawn backwards, thus increasing the deep hollow of the chest on each side of the spinal column; the outer curves are raised and pushed outwards, but each rib is raised and pushed outwards less than that above it. The cartilages of the sixth and seventh ribs near the sternum do not project so far as those of the superior ribs; the range of their forward movement is limited by

12.—EFFECTS OF ARTIFICIAL RESPIRATION ON THE POSITION OF THE RIBS AND INTERNAL ORGANS.

MRS. CROSS, AGED ABOUT 50,
PATIENT OF DR. HUTCHINSON; HYPERTROPHY OF HEART—ANASARCA.



1. Inferior margin of lungs *before* they were inflated; 1*a*. Inferior margin of lungs *after* they were inflated.—2. Lower border of the heart *before* the lungs were inflated; 2^1. Lower border of the heart *after* the lungs were inflated; 2^2. Pericardial sac *after* being artificially distended by 26 ounces of water.—7. Liver *before* the lungs were inflated; 7'. Liver *after* the lungs were inflated.—8. Stomach *before* the lungs were inflated; 8'. Stomach *after* the lungs were inflated.

The *continuous lines* indicate the seat and form of the ribs *before* the lungs were inflated. The *interrupted lines* indicate the seat of the ribs *after* the lungs were inflated.

the lower extremity of the sternum, which does not advance so much as the upper portion of that bone.

This limited range of the forward motion of the cartilages reacts on the cartilaginous extremity of the sixth rib, the advance of which is much less than that of the seventh, and less still than that of the eighth rib. The movements of the latter ribs being much less restrained by the sternum, their cartilages advance more than those of any of the superior ribs.

The restraining influence of the sternum, with the protruding influence of the sixth and seventh ribs upon the conjoint sixth and seventh costal cartilages, produces a hollow or depression across those cartilages, at their sternal junction, causes them to protrude near their costal junction, and produces a slope inwards and upwards from the costal to the sternal end of the depression.

The sternal portions of the fifth internal intercostal muscles raise and draw outward the combined sixth, seventh, and eighth cartilages, and withdraw the inferior and opposed edges of those cartilages from one another, thus increasing the angle formed between them just below and to the sides of the xyphoid cartilage. The opposite lower edges of the sixth, seventh ,and eighth costal cartilages are withdrawn more; the further they are from the sternum, the more distant they are from the axis of motion. The rounded cartilaginous extremities of the opposite fifth, sixth, and seventh intercostal spaces are likewise withdrawn from one another, the withdrawal of the seventh being greater than that of the sixth, which is again greater than that of the fifth.

The upper and lower edge of the sixth, seventh, and eighth ribs slide but little upon each other. As the distance between those ribs increases there can be no action of the intercostal muscles, excepting at their dorsal portions.

Ninth, Tenth, Eleventh, and Twelfth Ribs.—The ninth, tenth, eleventh, and twelfth ribs are raised by the levatores costarum. As each rib is moved upwards less than that above it, the eleventh and twelfth being scarcely elevated, the distance between these ribs increases, the anterior extremities of the lower ribs are less raised and pushed forward than those of the upper. The posterior angles of those ribs are drawn backwards, and their cartilaginous ends outwards, by the *serratus posticus inferior.* As the ninth and tenth ribs are attached by ligamentous union to the lower edge of the eighth rib and to each other, their movements are controlled by those of the superior ribs; but their cartilaginous extremities are not advanced, and their outer curves are not expanded so much as are those of the eighth rib.

Action of the Seven Lower Ribs.—From the formation and movement of the seven lower ribs the lower portions of both lungs are distended; in front, by the forward movements of the costal cartilages; to the side, by the increase of the outer curves; and behind, by the projection backwards of the angles of the ribs, and the consequent deepening of the hollow at the side of the vertebræ. The lowest portion of lung is behind, and is expanded by the movements backward of the inferior ribs.

It follows from the examination of the change

effected in the costal walls of the chest during a deep inspiration, that the upper portion of each lung is expanded above, to the side, and in front, while the inferior portion is expanded below, to the side, and behind.

The dorsal vertebræ project backwards, the cervical vertebræ are lowered and move forward, the hollow in front of the upper dorsal vertebræ is increased, and the sternum and spinal column become more distant.

To permit a free expansion upwards of the costal walls, each scapula is drawn upwards and out of the way by the levator anguli scapulæ.

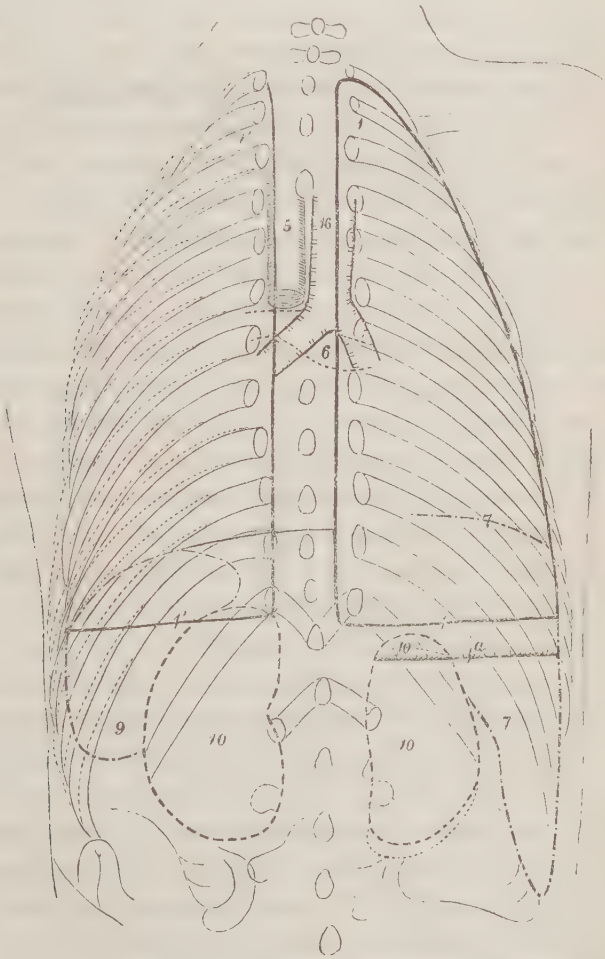
Additional Muscles used in Deep Inspiration.—In effecting a deep inspiration the following muscles add their influence to those recited above.

The sterno-cleido-mastoid, their fixed points being lowered and brought forward, contract strongly, and draw up the sternum and the sternal end of the clavicle. In addition, the os hyoides is raised by the genio-hyoid and digastricus. The thyroid cartilage is drawn upwards and backwards by the thyro-hyoid. The omo and sterno-hyoid and sterno-thyroid assist in raising the sternum and the scapula.

The dilators of the nostril, the separators of the lips, the depressors and movers forwards and downwards of the tongue, and the elevators of the palate, increase the inlets of air, and convert the gorge for the food into an air passage. The head and upper cervical vertebræ advance. The occiput descends, the mouth and nostrils are raised, and the air passages are straightened. The scapulæ are raised by the upper head of the trapezius.

13.—EFFECTS OF ARTIFICIAL RESPIRATION ON THE POSITION OF THE RIBS AND INTERNAL ORGANS.

THOMAS MALVERN, AGED 31,
PATIENT OF DR. J. C. WILLIAMS; PHTHISIS—HÆMOPTYSIS; LUNGS ADHERENT.



1. Lower margin of right lung *before* it was inflated; 1*a*. Lower margin of right lung *after* it was inflated; 1'. Left lung.—16. Trachea.—5. Aorta.—6. Branches of pulmonary artery.—7. Liver.—9. Spleen.—10. Kidnies: strongly-marked line, *before* the right lung was inflated; faintly-dotted line, right kidney, *after* the right lung was inflated.

The *continuous lines* indicate the position of the ribs *before* the lungs were inflated. The *interrupted lines* indicate the position of the ribs *after* the lungs were inflated.

Diaphragm.—The diaphragm, the bulging floor of the thorax, the domed roof of the abdomen, is universally, but unequally lowered. The whole circuit of its attachment, except at the vertebræ, is enlarged by the costal expansion; its superficial area is consequently increased.

The right bulge, being the highest and the most moveable, is lowered more and made flatter than either the left bulge or the central portion.

Muscular contraction first flattens the bulge, and then draws down the flattened floor in its whole circuit. During its descent the web of the muscle leaves the costal walls suddenly, almost at right angles, so that the form of the diaphragm exactly coincides with that of the lowered base of the lungs, the concavity of which it lessens. The descent is nearly equal at all points; it is least towards the spinal column. On a deep inspiration the diaphragm draws down the right lung, so that, in front it is behind the lower end of the xyphoid cartilage; (diagrams 11, 12, and L. 1 and 2;) to the sides, it is within the costo-cartilaginous junction of the eighth, ninth, and tenth ribs; (diagrams 11 and 6;) and behind, near the spinal column, it is in front of, or a little below the lower edge of the twelfth rib. (Diagram 13.)

On Inspiration the Liver is pushed down and compressed.—The diaphragm pushes the liver downwards and forwards, flattens its convex upper surface, and compresses its bulk between itself and the abdominal muscles. The central tendon of the diaphragm, where the vena cava passes through it, gives off a strong sheath of tendinous fibres, which

encircles the vein, strengthens its walls, and connects it by continuity of structure with the diaphragm. As this fibrous sheath extends to the smaller veins in the body of the liver, the movements of the diaphragm do not drag on that organ at one point, but diffuse their traction through its substance by a continuation of its tendinous fibres. The lower edge of the liver descends very little, as is indicated by percussion. (Diagrams L. 1 and 2.)

As the expansion of the chest during inspiration expands the cavities of the heart, a greater quantity of blood is then poured out of the veins of the liver into the right auricle than when the chest is contracted and the cavities of the heart are lessened by expiration. Indeed, the liver, like the veins in the neck and thyroid body, serves as an ever-varying reservoir that adapts itself to the ever-varying capacity of the heart's cavities, that enlarges when they become smaller, and lessens when they become larger.

The Enlarged and Hardened Liver pushes up the Diaphragm and lessens its descent—When the liver is greatly enlarged, as in diagram 10, it pushes up the diaphragm, impedes its descent, and lessens the extent to which the lower lobes of the right lung may be expanded.

If the liver be hard, as in the hobnail disease; or unyielding, as from abscesses, hydatid cysts, or malignant growths; or firm, as in the fatty degeneration, the flattening of the right bulge of the diaphragm is impeded.

Movements of the left Bulge of the Diaphragm not so great as those of Right.—The left bulge is not so much flattened and does not descend so far as the right. The lower edge of the left lung is

usually lower than that of the right; on a deep inspiration the right is nearly as low as the left; consequently the lower edge of the left lung does not descend so much as that of the right.

Descent of the Trachea.—The bronchial tubes, the trachea, and larynx, descend during inspiration. The inspiratory descent of the larynx may be seen. In the subject from which diagram 11 was taken, the bronchial tubes and trachea descended when the lung was inflated.

Descent of the Central Tendon draws down the Heart.—The central tendon is drawn down by the contraction of the muscular fibres all round. As the right and left bulges descend they lower the central tendon on each side. In front it is lowered and brought forward by the muscular fibres proceeding upwards, backwards, and inwards, from the seventh and eighth costal cartilages. The descent of the diaphragm at the centre is not so great as at the sides; but in front, where it is behind the epigastrium and ribs, and where it can be examined during life, the descent of the central tendon, and consequently of the heart, is nearly if not quite as great as the descent of the lower edge of the left lung. (Diagrams 11, 12, and L. 1 and 2.)

The Fibrous Pericardium is an expansive insertion of the Central Tendon.—The fibrous aponeurosis that strengthens the free pericardium is, in fact, an aponeurotic expansion, a webbed fibrous insertion of the central tendon of the diaphragm, to the whole circuit of which it is attached. When the diaphragm descends it stretches and draws down its aponeurotic insertion, the fibrous pericardium, lengthening the pericardial cavity. The forward movement of

the sternum increases the space between the sternum and vertebræ, and expands the fibrous walls of the pericardial sac. The expansion of the walls of the chest expands the lungs, tends to draw them away from the pericardium, and thus expands its side walls.

The Heart's Cavities are expanded.—The expansion of the pericardial fibrous sac causes an expansion of such cavities of the heart as are not in a state of active contraction; consequently these cavities, the auricles, and the ventricles, during their diastole, contain more blood during an inspiration than during an expiration. The inspiratory expansion of the walls of the heart resists, in some measure, the contraction of the ventricle, and takes away its force. The arterial circulation is consequently not so active, the pulse is not so strong, during inspiration as during expiration.

The Heart's Superficial Dulness.—The usual extent of the space where the heart lies just behind and in contact with the sternum and costal cartilages, which space, for conciseness, may be styled the region of the heart's superficial dulness, is seen in diagrams 1, 2, 3, 4, and L. 1 and 2, and is described above at page 315.

The combined influence of the advance and expansion of the walls of the chest, and of the descent and extension of the diaphragm, does not enlarge and draw down the heart so far as it advances, expands, and lowers the lungs in front of the heart. The space of the heart's dulness is shortened, narrowed, and brought down. (Diagrams 11, 12, 13, and L. 1 and 2.)

The deepest possible inspiration, even in emphysema, never obliterates the region of the heart's dulness. It is often seated quite below the sternum and behind the xyphoid cartilage, the epigastrium, and the left sixth, seventh, and eighth costal cartilages.

Seat of Impulse in repose.—The heart's impulse in the state of repose is felt sometimes between the fourth and fifth, and sometimes between the fifth and sixth ribs. The shock of the apex is felt lower and more to the left than the impulse of the right ventricle, being generally below or just to the right of the nipple, and a little to the left of the region of the heart's superficial dulness, the thin portion of lung interposed between the apex and the walls of the chest being pushed aside by the systole. The shock at the apex rises very firmly, gives a lengthened blow, and falls back very suddenly. The gentler, slower, less firm impulse of the right ventricle is seldom to be felt in large-chested persons; but in those with moderate-sized or narrow chests it is perceptible over the fourth or fifth intercostal space from the point of the apex to the sternal wall, and also over the costal cartilage above that space, and very gently over the space above. The smaller the chest the more extensive is the seat of the heart's impulse.

On a deep inspiration, the impulse of the Heart is lowered to the Epigastrium.—On a deep inspiration, and in emphysema, bronchitis, and those diseases where the heart and lungs are dilated and lowered, the region of the heart's superficial dulness is lowered and narrowed, and the dilated lung is further interposed between the apex of the heart

and the walls of the chest. The seat of the impulse is lowered; it is usually felt over the xyphoid cartilage, the epigastrium, and the combined cartilages of the sixth and seventh ribs.

The apex of the heart cannot be felt through the thickened lung. As the impulse is due to the contraction of the right ventricle, it is slow, heaving, rises gently, gives no blow, and falls back quickly, but not abruptly. The impulsive, loud, sharp, clacking noise that begins the systolic sound is not now heard over the usual, but over the lowered space of the heart's dulness.

The Heart's sounds are feebler over the great vessels.—The lungs between the great vessels and the upper part of the right ventricle are much thickened and lowered; consequently the heart's sounds, especially the second sound, are much fainter over the upper part of the sternum.

Inspiration increases the Blood in the Lung's Vessels as well as the Air in the Air-Cells.—The inspiratory expansion of the chest and lungs dilates the air-cells and expands the pulmonary blood-vessels. While more air is drawn into the bronchial tubes and air-cells, more blood can be and is propelled into the pulmonary vessels.

The expansion of the lung assists the action of the right ventricle by increasing the size, the area of the pulmonary arteries, capillaries, and veins. This assistance more than counterbalances the opposition offered to the contraction of the right ventricle by the expansion of the chest. The resistance to be overcome is diminished much more than the power to overcome that resistance is lessened.

At the same time that there is the greatest volume of air in the air-cells there is the greatest quantity of blood in the lung's capillary vessels to be arterialized by that air, and there is the greatest mass of blood in the right cavities of the heart to supply those vessels. Those reservoirs, the veins of the neck and thyroid body, the liver and spleen, that collect the blood during expiration for the right cavities, contain during inspiration the smallest quantity of blood. There is then the smallest amount of blood sent from the lung into the left auricle by the action of the right ventricle; and the blood is sent with the least force, and in the smallest volume, from the left ventricle into the system.

The blood is, in fact, drawn into the heart and detained in the vessels of the lungs in the greatest quantity while there is the largest volume of air in the air-cells to act on that blood. When the chemical agent is most abundant, the chemical action most vivid, the supply of material to be acted on is greatest; when the fire is most active, the fuel is most abundant.

The Inspiratory Descent of the Heart.—The heart is fixed in its relation to the lungs at the left auricle by the pulmonary veins; as the lungs descend the heart descends also. The ventricles and right auricle are further lowered by the descent of the central tendon. The descent of the heart lengthens the ascending aorta, gives the arch of the aorta a sharper turn, and draws down the innominata, subclavians, and carotids. At the same time that the arteries in the neck descend the sternum rises; the arteria innominata, that in repose ascends from half

an inch to an inch above the sternum, is seated, on a deep inspiration, behind that bone.

Before tying the arteria innominata, the subclavians, or carotids, it will be well to restrain the full expansion of the chest by a roller placed round its costal walls. This step will retain the arteries above the sternum, and prevent the air from rushing into the auricle through the veins when that cavity is dilated by expansion of the chest. This plan distends the veins—a slight evil compared with the ill effects averted by its adoption.

Contraction of the Diaphragm tends to draw back the lower end of the Sternum.—The diaphragm, when it lowers the central tendon and the heart, tends to draw back the xyphoid cartilage and the lower edge of the sternum; its action counterbalances, in some measure, the advance of the sternum occasioned by the forward movement of the first six ribs and their cartilages. In children, where the sternum is very flexible, and the contraction and descent of the diaphragm are great, the lower end of the sternum and the xyphoid cartilage are drawn backwards on deep inspiration. In the aged, on the other hand, where the xyphoid and costal cartilages become ossified, and form with the sternum one bony framework, the lower end of the sternum and xyphoid cartilage advance more than the upper portion. The motion being most extensive where the distance from the axis of motion is greatest.

Descent of the Diaphragm lowers the Abdominal Viscera.—The diaphragm on its descent pushes before it the liver, spleen, stomach, pancreas, and upper part of the kidneys. The forward and down-

ward motion of these ograns, each of which is immediately below the diaphragm, displaces the intestines and the abdominal parietes.

The abdominal walls advance to a considerable extent on a deep inspiration ; their forward motion tells accurately the extent of the descent of the diaphragm. If the abdominal muscles be tense and stationary during inspiration, the diaphragm is motionless; its movements being prevented either by inflammation of the diaphragm itself, of the lower parts of the lungs, or of the peritonæum. Whenever motion of the diaphragm tends to cause suffering or to increase disease by moving inflamed parts, that motion ceases, and the lungs are dilated by the increased enlargement of the upper and anterior part of the chest.

If one side of the diaphragm be at rest while the other side moves, active disease of the lung on that side, or of the heart is indicated.

Tight Lacing impedes the expansion of the lower Lobes of the Lungs.—Tight lacing around the lower ribs and abdomen interferes with the free descent of the diaphragm, impedes the expansion and causes permanent narrowing of the lower portion of the chest, brings the opposite costal cartilages below the sternum near each other, and produces an undue development of the upper and front part of the chest. (Diagram L. 2.)

In Fits of Hysteria, the Vocal Chords close the Larynx.—In fits of hysteria the vocal chords meet and vibrate during inspiration ; the cooing noise is an inspiratory vocal sound. (Ventriloquism.) The struggling is the convulsive attempt to overcome the

closure of the vocal chords by a forcible inspiration. The inspiratory muscles act, the diaphragm is lowered, the sternum, ribs, and cartilages fall in, and the chest is narrowed.

When the Larynx is much narrowed, forced Inspiration lowers the Diaphragm and depresses its Costal Walls.—When the larynx is narrowed by disease but little air is admitted into the chest during strong inspiratory efforts, the diaphragm descends to an unusual extent, the sternum and costal cartilages fall back, the ribs are lowered, and the chest is narrowed.

In a patient suffering under these circumstances and presenting these appearances, laryngotomy was performed. Immediately after the free admission of air to the lungs, the sternum and cartilages advanced, the chest expanded, and the diaphragm ascended.

ON EXPIRATION AND THE MECHANISM AND MOVEMENTS EFFECTING IT.

Sternum, and with it the Ribs, lowered.—The recti abdominis, the antagonists of the scaleni, draw down the sternum and with it the cartilages and ribs connected to it. The triangulares sterni lower and bring nearer to the sternum and make more angular the junctions of the second, third, fourth, fifth, and sixth ribs with their cartilages, lower the projection of the cartilages of the sternum, and narrow the capacity of the chest.

The transversales abdominis, which are virtually continuations of the triangulares sterni, and in most of the lower animals combine to form but one pair of

muscles, draw the opposed lower edges of the costal cartilages of the lowest ribs near to each other, bring forward the posterior angles of the ribs, thus lessening the hollow to the side of the vertebræ, narrow the lower part of the chest, compress the whole abdominal viscera, and force them upwards against, and through their medium, elevate the diaphragm.

The triangulares sterni are counter-agents to the levatores costarum, the external intercostals, the sternal end of the internal intercostals, and the serratus posticus superior. The transversales counteract the diaphragm, the levatores costarum, and each serratus posticus inferior.

The external oblique draws downwards, inwards, and backwards, the cartilaginous ends of the eight inferior ribs.

The quadratus lumborum fixes the lowest rib. The six inferior intercostals approach each higher rib to the lower.

Forcible Expiration.—On a forcible expiration, not attended by closure of the vocal chords, in addition to the muscular actions just stated, the sacro lumbalis and latissimus dorsi draw down the ribs posteriorly. The scapulæ are drawn downwards and backwards by the lower fibres of the trapezii and the latissimi dorsi and rhomboidei. The serratus magnus, acting from the scapulæ thus fixed, draws downwards and backwards the eight superior ribs.

Violent Expiratory Efforts, when the Vocal Chords close the Larynx.—In coughing, laughing, the violent expiratory fits of epilepsy, and on any violent act of exertion, the vocal chords are firmly brought

together, to prevent the expulsion of air and give a fixed point on which the expiratory muscles may act strongly.

When violent expiratory efforts attempt to force asunder the closed vocal chords, the sternum is drawn down with great violence by the recti, all the abdominal muscles act strongly and are assisted by the levatores ani. In addition to the muscles employed during forcible expiration, the ribs are all lowered and brought nearer to each other by all the intercostals, and the scapulæ are lowered by the greater pectorals The arms are made rigid by the contraction of their muscles. The fasciæ of the neck are made tense, so that they may support the swollen veins, by the platysma, the sterno-cleido-mastoid, the sterno-hyoid, and thyro and omo-hyoid. The summit of the lung is strengthened and supported by the scaleni. As soon as the vocal chords separate, all the muscles relax, and vocal vibrations are elicited.

Vomiting.—In vomiting, the vocal chords do not come together, but there is perfect closure of the larynx. The os hyoides and the larynx are drawn forcibly forwards and upwards under the base of the tongue. The pharynx occupies the usual place of the larynx, and the expelled food slides over the back of the pharyngeo-laryngeal septum, and then over the under surface of the epiglottis. The forcible pressure of the upper edge of the thyroid cartilage against the base of the tongue and os hyoides, gives an effectual base of support for the violent expulsive exertion, and prevents the food from slipping into the upper part of the larynx.

In Expiration the Lungs and Heart are compressed, lessened, and raised.—The contraction of the walls of the chest compresses and lessens the elevation of the diaphragm, and raises the lungs and heart. The heart is not so much compressed and lessened as are the lungs, therefore a greater portion of that organ comes in contact with the walls of the chest.

Heart's Superficial Dulness and Seat of Impulse raised and extended.—The region of the heart's superficial dulness is raised and enlarged. The shock of the apex is stronger, and instead of being felt between the fourth, fifth, and sixth ribs, as in repose, is now raised to the space above, and is felt either over the fourth or third intercostal space, a little to the right of the nipple. The impulse of the right ventricle is more extensive and stronger, and is usually felt over the second, third, and fourth intercostal spaces, and sometimes behind the sternum. The impulse shock, or sharp noise beginning the systole, is heard over a higher and more extensive surface.

Heart's Sounds are louder.—The heart's sounds are heard more loudly, and with greater clearness, over the whole chest, especially over the great vessels.

Action of Systemic Ventricle stronger; it sends more blood into the system.—The blood that had been accumulated and arterialized in the lungs during the previous inspiration is sent into the left auricle by the combined influence of the systolic contraction of the right ventricle and the contraction of the walls of the chest; the thoracic contraction compresses the lungs, lessens the pulmonic blood vessels,

and forces forward the blood they contain. The systolic contraction of the left ventricle is assisted by the expiratory compression from the sternum and costal walls.

The blood is sent from the left auricle into the passive left ventricle by the contraction of the elastic walls of the pulmonary artery, which had been previously enlarged and distended by the action of the right ventricle.

The force of the systole of the left ventricle is increased by the expiratory contraction of the chest. The blood that has been arterialized during inspiration is sent into and through the system with increased force and speed. At the same time that the contraction of the chest hinders the returned blood from distending the right auricle, that blood collects in and distends the veins of the neck and thyroid body of the liver and spleen.

Less Blood is received into the Right Auricle and Ventricle.—A diminished quantity of blood is sent into the right auricle, through the systemic circulation, by the contraction of the left ventricle; and from the auricle into the ventricle, by the return of the elastic walls of the arteries to their previous size, after being distended by the systole of the left ventricle.

The smallest amount of blood is sent by the right ventricle into the blood-vessels of the lungs when there is the least quantity of air in the air-cells to arterialize that blood.

At the time that the blood is sent with greater force in increased quantity through the system it is sent with diminished force in lessened quantity through the lungs.

On the other hand, during inspiration, when the blood is sent with increased force in greater quantity through the lungs, it is sent with diminished force in less quantity through the system. These apparent contradictions reconcile themselves into perfect adjustment.

The greatest quantity of blood is required in the lungs' vessels during inspiration, when there is the greatest amount of air in the lungs' air-cells to act on that blood; and the greatest quantity of arterialized blood is required in the system during expiration, when the energies of the system are greatest and its muscular exertions most powerful.

Energetic acts performed during Expiration, when the Systemic Circulation is most active.—All the violent acts of exertion are performed during expiration, as lifting weights, wrestling, and coughing. The more energetic the exertion the more active is the required supply of arterialized blood. Exactly in proportion to the energy of the exertion is the rate of breathing and of circulation.

The same person that reposing in bed has a pulse of 50 or 60, and breathes 15 or 16 times in a minute, has when running a pulse of about 180, and breathes about 50 times in a minute; the pulse being stronger, the breathing fuller, during running than in repose.

Fits of Epilepsy; violent expiratory attempts to part the Vocal Chords.—In the fits of epilepsy, when the vocal chords come together, and the expiratory muscles struggle with terrific energy and in vain to separate them, the circulation is very much more energetic at first; but as the pressure on the ventricles impedes their passive expansion, the pulse

soon becomes feeble, almost imperceptible; all the blood seems to be pressed out of the system and lodged in the skin, so turgid are its veins and capillaries. In a case of epilepsy, immediately after a fit the respirations varied from 60 to 30; the pulse was at first 230 in a minute, and diminished rapidly to 120.

PECULIARITIES IN THE RESPIRATORY MOVEMENTS OF CHILDREN.

In children, when compared with adults, the costal cartilages and sternum are very flexible. The inferior margins of the lungs are lower, being usually behind the sixth costal cartilage or sixth intercostal space; the liver is much larger, and the stomach and bowels are more distended in comparison with the size of the lungs; (diagram 5;) consequently the abdomen is more protruding, the seventh, eighth, ninth, and tenth ribs and their cartilages project more to the side, and the epigastrium and xyphoid cartilage are more prominent.

The abdomen is greatly more developed than the chest; consequently, the precise lower margin of the lung and upper bound of the liver and stomach, where they lie behind the ribs and epigastrium, are very apparent, the latter bulging forward suddenly, while the former generally falls in a little from the prominence over the superior costal cartilages.

On a deep inspiration the descent of the diaphragm pushes down the liver and stomach, and draws the lungs down to the place previously occupied by those organs. The lungs descend to the seventh rib or sixth intercostal space, and the chest

becomes narrower, after which the comparatively small lungs replace the more bulky liver and stomach. The xyphoid cartilage and the seventh and eighth ribs fall in, being pressed back by the weight of the atmosphere, and the edges of the opposed sixth and seventh costal cartilages approach each other.

RESPIRATORY SOUNDS HEARD OVER THE TRACHEA AND LUNGS.

Laryngeal Sounds.—During ordinary respiration the sounds generated in the larynx by the passage of the air between the vocal chords are smooth, rather loud, and somewhat hissing.

The sound heard on inspiration is almost identical in character with that heard on expiration, but is a shade sharper. The smaller the larynx, the quicker the breathing, the sharper and louder are the sounds produced. The larger the larynx, the slower the breathing, the softer and graver,—more murmuring,—are the respiratory sounds.

In children whose larynx is small and whose breathing is quick, the sound is sharp, loud, and hissing; in large larynxed men it is faint, soft, and murmuring. The deeper the vocal tones, the softer and graver are the respiratory sounds heard in the larynx.

Inspiratory Sounds, Extent and relative Intensity.—The inspiratory sound, excited in the larynx, is conducted by the trachea and bronchial tubes, and is carried by the air, in the air tubes, to the surface of the chest. The nearer the wall is to the larynx, or

to a large bronchial tube, the louder is the respiratory sound, the more alike is it in character to the laryngeal respiration. Over the upper part of the sternum to each side of it, especially to the right, the sound is rather loud, but is softer, less continuous, and more murmuring than it is over the larynx. Over the upper front of the chest, below the clavicles, the sound is gentle murmuring; over the lower part of the front of the chest it is often inaudible and is always feeble; over the dorsum the sound is distinct, soft, and murmuring, between the scapulæ; it is somewhat louder on the right side than on the left; below the scapulæ it is very faint indeed.

In children whose laryngeal sound is sharp and loud and the walls of whose chest are nowhere very distant from the origin of the sound, the respiratory murmur is much louder than in man; it is in fact "puerile." In women the respiratory murmur is fainter than in children, but louder than in men.

At the beginning of an inspiration the respiratory murmur is louder than it is towards the end, when indeed the surface is further from the source of sound. When breathing is quickened, the inspiratory murmur is everywhere louder; and the sound heard over the lungs is nearly as loud at a distance from, as it is near to the larynx.

Expiratory Sound.—The expiratory sound is almost as loud and as sharp over the larynx as the inspiratory; but as the current of air carries away that sound from the lungs, it is only conducted to them by the solid walls of the trachea and bronchial tubes. The expiratory sound is, in consequence,

very faint indeed; in the adult it is usually only heard in the neck, and to the right, sometimes to the left of the sternum; also to the right, sometimes to the left of the vertebræ near the bases of the scapulæ.

In old persons the expiratory sound is scarcely audible except in the neck; but in children and, to a less extent, in females, it is louder and more extensive than in adult males.

On breathing quickly the expiratory sound is heard everywhere, and is quite as loud as the inspiratory.

Laryngeal Sounds are conducted to the surface and heard there on tranquil breathing.—During ordinary inspiration the inspiratory murmur is doubtless due to the conduction of the laryngeal sound, and not to a new sound generated in the air-cells: else would the inspiratory murmur be loudest where the air-cells are most numerous; but the reverse of this is the case.

In tranquil inspiration, the air, as it advances, occupies more space, moves slower, and with less friction. In expiration, on the other hand, the air occupies, as it advances, a constantly narrowing space, moves quicker, and with more friction—conditions more favourable to the eliciting of sound; but the movement of the air is so slow, especially in adults, that no sound is produced; and, as none is conducted, none is heard.

Respiratory Sounds excited in the tissue of the Lung during hurried breathing.—When the breathing is hurried, or voluntarily quickened, the inspired air generates sound by friction against the sides of

the tubes, small and large; during rapid expiration sound is excited in like manner, but as the air passes from a larger into a smaller space, it is often a shade louder than it is during rapid inspiration. These sounds are heard quite as loud over the lower and more distant as over the upper and nearer portion of the lung.

VOCAL VIBRATIONS AND PECTORAL RESONANCE.

Vocal Vibrations in the Vocal Chords excite Chest Vibrations.—The vibrations of the vocal chords and larynx give rise to the sound that is moulded by the mouth, tongue, palate and lips, into speech. These vibrations excite others in the walls of the trachea and the bronchial tubes, and in the air contained in those passages and in the air-cells. Finally, corresponding vibrations are excited in the surrounding walls of the chest; so that when the hand is laid on the chest of a person speaking, its walls are felt to vibrate in unison with the vocal sound.

Pectoral Resonance.—On applying the ear to the chest the walls resound. The voice seems to spring from the spot listened to; and, indeed, sound is there produced and there heard. The sound excited in the vocal chords begets the sound heard over the walls of the chest.

The deeper, the graver, the more sonorous the voice, the larger are the vocal vibrations; the more readily, too, they excite like chest vibrations.

The pectoral vibrations and resonance are more distinct and louder in the large-larynxed, bass-voiced man, than in the small-larynxed, treble-voiced woman.

Loudest over the upper part of the Chest, and when there is no solid organ below the Lung.—The pectoral vibrations and vocal resonance are strongest and loudest over the upper fore part of the chest, and wherever the mass of lung is greatest, wherever there is most room for the play of the vibrations. They are louder and more universal over the front of the right than of the left side, over the mass of the right than of the left lung; indeed, over the left side, the heart quite stops these vibrations as well as those excited by percussion. The liver and spleen also limit the seat of these vibrations; where the liver and spleen bulge up the diaphragm, they damp, make more faint and less perceptible, the vocal vibrations excited over the interposed marginal film of lung. The resonance is equally loud over the whole dorsum to the tenth rib; below this it is partially deadened by the bulging liver and spleen.

Over the lower parts of the Margin of the Lungs the resonance is loudest at the beginning of the Expiration.—Over the lower part of the chest and in the neighbourhood of the heart the pectoral resonance is loudest during the first part of the vocal expiration, especially if that expiration be preceded by a deep inspiration. Towards the end of the expiration, though the voice be still as loud and as deep, the vocal resonance becomes feebler or even entirely disappears.

This diminution of vocal resonance is due to the ascent of the diaphragm, lungs, and abdominal organs, so that the surface, behind which was the lung conveying the vibrations, has at last that lung

replaced by the liver, the heart, or the spleen, checking those vibrations.

In one case the vibrations over the back were perceived lower down on the left than the right side, due I suppose to the neighbouring stomach. In another, that of a man, whose voice was very sonorous, whose lungs were very ample, and the framework of whose chest was remarkably strong, the vocal vibrations were heard distinctly over the whole of the costal walls, even where they covered the solid viscera.

As a general rule, the pectoral vibrations are strong, and the vocal resonance is loud, where the sound on percussion is clear and ringing.

THE FORM OF THE SURFACE OF THE BODY INDICATES THE SEAT AND OUTLINES OF THE INTERNAL ORGANS.

The modification in form and size of the walls of the chest modifies the size and alters the boundaries of the lungs. The solid organs, the heart, the liver and spleen, and the distended cavities, the stomach and intestines, push forwards and outwards the external walls of the chest and abdomen.

The more ample the Chest, the larger the Lungs.—The more the cavity of the chest is enlarged by the extension of its walls, the larger are the lungs below those walls. If we see that the walls are projecting, rounded, and enlarged, we judge that the lung is expanded.

Solid and distended Viscera project the Surface over them.—The larger the heart, liver, and spleen, the greater the distension of the stomach or intes-

tines, the further forward or outward do they push the parietes over them. The more prominent or projecting are the walls superficial to any one of these organs, the larger or more distended do we judge that organ to be.

We have here an eye diagnosis of leading value, a superficial index pointing to the organs that require deeper and closer scrutiny; a method of telling at a glance the outlines of the more important organs.

CHILDREN. (DIAGRAM 5.)

Abdomen much distended; Chest narrow; lower boundaries of Lungs and Heart readily seen.—The disproportion between the bulk of the abdominal and thoracic organs is greater in children than in those grown up; and in children it is that the boundaries of these organs are most palpable. We have but to look on the paintings of the great masters, at the poised cherubs, or staggering young bacchanals, and we shall require no anatomy to tell us where ends the chest, where begins the belly. These faithful delineators portray, through the mould of the surface, the relative place and bulk of the inner parts, as accurately as they do the muscular development.

Form of Sternum.—The sternum is usually most prominent at its attachment with the third, fourth, and fifth ribs, where the thymus body and the approaching edges of lung are in front of the great vessels. From the attachment of the fifth cartilages, the sternum usually slopes very gently to its lower end,

which is in front of the lower margin of the right lung and the lower bound of the heart, where it usually falls in rather suddenly. The sternal end of the xyphoid cartilage partakes of the depression of the sternum; it projects forwards to its free end, being raised by the prominent liver.

Form of the Costal Cartilages.—The fourth and fifth costal cartilages are usually on a plane; they are more prominent than the rest of the cartilages. Below the fifth cartilage there is a slope coinciding with the slope of the lung on the right side, of the heart on the left. This slope gives place to the prominences, formed by the liver and the stomach over the sixth costal cartilage, if the lower margins of the right lung and heart be there.

Depressions over the lower margin of the right Lung and lower bound of the Heart.—The depressions thus formed between the slope of the lungs and heart, and the prominence of the liver and stomach, extend obliquely upwards and inwards, from the sixth rib across the cartilages of the sixth and seventh ribs, to the lower end of the sternum.

Costal Cartilages more prominent than the Sternum.—As the cartilages of the ribs are pushed forward further than they draw forward the sternum, they are, especially the third, fourth, fifth, and sixth, more prominent than that bone.

The bulges forward of the lungs and heart coincide with these prominences; that over the lung expands the lung to fill it; but that over the heart is partially protruded by that organ.

Costal Cartilages over the Heart more prominent than those over the right Lung.—The heart and the

bulge over the heart are a shade more prominent than the right lung and the prominence over it. The lungs and heart, and the cartilages over them, slope respectively inwards to the centre of the sternum.

The Liver and Stomach project more than the Lungs.—The liver and stomach project at the sides more than the lungs, push forward the lower costal cartilages, enlarging the angle formed between their opposed edges below the sternum, and distend the abdomen between the eleventh rib and the crest of the ileum.

Depression over the inferior bounds of the Chest Organs lower on a deep inspiration.—It has been before expressed (p. 371) that the depression formed at the lower margin of the thoracic, and the upper bound of the abdominal organs, is lowered on a deep inspiration. The xyphoid cartilage and the sixth and seventh costal cartilages, before pushed forwards by the liver, then fall in.

As the child grows older the disproportion between the thoracic and abdominal viscera becomes less, and the depression indicating their boundaries is less marked.

At the age of eleven or twelve the upper part of the chest and the middle of the abdomen are about equally prominent; as the lungs and heart slope to their lower margin, and as the liver and stomach project from their upper bound, there is a marked depression over those boundaries.

The depression goes obliquely upwards across the conjoint sixth and seventh costal cartilages, from the fifth intercostal space to the lower end of the sternum. As the costal cartilages are more pro-

minent than the sternum, the depression, as it crosses those cartilages, slopes inwards to the sternal extremity.

Prominences of the Sternum and Costal Cartilages.—The sternum is usually most prominent at its junction with the fifth costal cartilages. The upper extremity of the second bone of the sternum and the second costal cartilages are on a level. The lower costal cartilages, down to the fifth successively, project more than the sternum; a sternal hollow is thus formed, which is deepest where the costal cartilages are most prominent.

The costal cartilages project more on the left side, over the region of the heart, than they do on the right side, over the right lung; the projection, too, is broader, extending from the sternum to the nipple, on the left side; while on the right it slopes off half way between the sternum and the nipple.

Projection of the Liver and Stomach—The sixth, seventh, and eighth costal cartilages project forward, gradually more and more, from the depression downwards; besides their forward and outward movement due to the action of their proper muscles, they are pushed forwards and outwards by the liver and stomach. The degree to which they are protruded depends on, and is an index to, the size of those organs. As the liver is usually larger than the stomach, these cartilages are generally more prominent on the right side than on the left; but if the stomach be distended, as it is after a hearty meal, the order is reversed, and they project more on the left side than the right.

As the sixth, seventh, and eighth cartilages are pushed outwards by the distending action of the liver and stomach, the angle formed between their opposing edges below the sternum is greater than it is in the adult, in whom the liver and stomach are comparatively smaller, but not so large as in the infant, in whom those organs are comparatively larger.

The lower edge of the liver is often marked by a slight ridge.

The liver and stomach are each larger at the side than the lung, and the seat of each is pointed out by a gradual swell or bulge. As those organs do not now descend below the lower edges of the costal cartilages, those lower edges are not prominent.

The cartilages are not now so flexible as they are in the child; the movement of each cartilage is more controlled by the movements of the rest.

On a deep Inspiration the Bulges of the Chest and Abdomen advance; the intermediate Depression descends with lower edge of the Lung.—On a deep inspiration the prominences of the sternum and the costal cartilages, and the abdominal protuberance, respectively advance. The lower part of the sternum, the xyphoid cartilage, and the depression indicating the lower boundaries of the lungs and heart, advance so little that they are almost stationary. The upper part of the abdominal prominence, just below the depression, does not advance at all—it appears to recede; the depression, indeed, becomes lower as the inferior boundary of the lungs descends. This descent of the depression, with the lung, is not by any means so well marked as it is in the child.

IN ADULT MEN. (DIAGRAM L. 1.)

The lower bounds of the Chest Organs are higher than in children or boys.—The chest has its developed and perfect form. The lower margins of the lungs, and the lower bounds of the heart do not descend so low as in the child or boy, the liver, stomach, and spleen rise higher.

The Bulges of the Sternum and Costal Cartilages are higher and fuller.—The lungs are developed upwards, and the chest is fuller on each side of the sternum. The sternum is most prominent about the junction of the fourth costal cartilages; the projection is most sudden at the articulation of the first and second bones. The projection at each side of the sternum is greatest over the fourth and fifth costal cartilages.

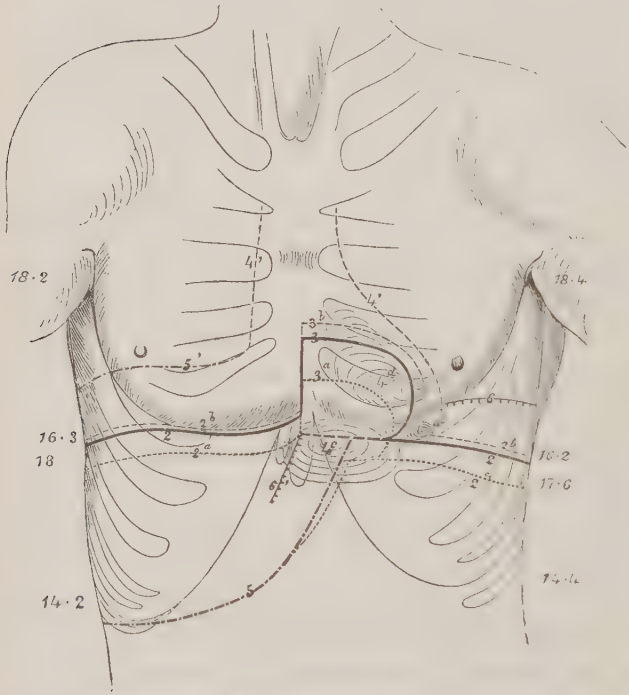
Depression between the Sternum and the Xyphoid Cartilage.—The sternum below its prominence is nearly vertical; it has a very gentle slope to the xyphoid cartilage; this cartilage usually projects a little at the tip; a depression is thus made at the lower edge of the sternum, corresponding to the lower margin of the right lung and the lower bound of the heart.

Depression over the lower bound of the Heart and Lung.—There is not so sudden a slope below the prominence of the costal cartilages, and the liver and stomach do not push forward the costal cartilages so far as in the boy; consequently, the depressions in front of, and corresponding with, the lower bounds of the heart and lungs are not so deep. Each depression is most evident where it crosses

THE LIVING SUBJECT.

L. 1.—HEALTHY ROBUST ADULT MALE.

SOLOMON BOWDLER, AGED 28, LABOURER.



2. Lower margins of the lungs, in a tranquil state, behind the fifth intercostal space, p. 316; 2 *a*. Lower margins of the lungs, on deep inspiration, descend to the sixth rib, p. 362; 2 *b*. Lower margins of the lungs, on forcible deep expiration, ascend to the lower edge of the fifth rib, p. 374.—3. Heart's superficial dulness, in a tranquil state, p. 315; 3 *a*. Heart's superficial dulness, on deep inspiration, is lowered and narrowed, p. 365; 3 *b*. Heart's superficial dulness, on forcible expiration, is raised and extended, p. 374.—4'. Boundaries of heart's deep-seated dulness, as ascertained by deep strong percussion, p. 322; 4 *b*. Heart's impulse, (indicated by the concentric curves,) in a tranquil state; apex, between the fifth and sixth ribs, below and to the right of the nipple, p. 366; 4 *c*. Heart's impulse, on deep inspiration, very slight at apex; of right ventricle, extensive at xyphoid cartilage and sixth and seventh costal cartilages, p. 366; 4 *d*. Heart's impulse on strong expiration; apex, fourth intercostal space; of right ventricle, from the third to the fifth costal cartilages, p. 374.—5'. Upper deep bound of the liver, p. 334–5; 5. Liver: the faint line near the xyphoid cartilage indicates the liver's descent on inspiration, p. 362.—6. Upper deep bound of the stomach, pp. 334–7–8; 6'. Bound of the stomach behind the liver, p. 338.

The shading just above the lower bounds of the right lung and the heart indicates the seat of the respective depressions over those boundaries.

The figures at the sides denote the *measurements* on each side, from the spine to the centre in front, under the *axilla*, over the *lower margins of the lungs*, and over the *lowest edge of the ribs* and their cartilages.

the sixth and seventh costal cartilages, obliquely upwards, from the fifth intercostal space to the sternum.

The Costal Cartilages are protruded by the Heart.—The costal cartilages over the heart are more prominent than those over the corresponding portion of the right lung. In the robust and large-chested this difference is not so marked as it is in the narrow-chested. In the latter, a greater portion of the heart is in contact with, and protrudes the costal walls, than in the former.

The liver and stomach do not push forwards and outwards the edges of the sixth, seventh, and eight cartilages so far as in the boy; but the lungs are more developed, and the increased muscular action to expand the lower part of the chest, draws outwards, and pushes forwards these cartilages to an extent nearly as great as the liver and stomach displace them in the boy. The opposed edges of these cartilages below the sternum usually form a right angle with each other.

The mode in which the depression across the sixth and seventh costal cartilages is formed by the restraint put by the sternum on the motions of the sixth costal cartilage is stated above (pp. 356-8.)

Lateral Bulge of the Liver, Stomach, and Spleen.—The liver, stomach, and spleen, are contained within, and protected by, the lower ribs and their cartilages. These organs have usually the same lateral bulges as the lungs in the adult, and their greatest projections are just below the lungs, for about two ribs' breadths. The lateral prominences over the lower margins of the lungs are due to the gradual

bulging out of the liver, stomach, and spleen. Below these projections the sides slope inwards and become narrow.

Form of the Side Walls of the Chest in the Athletic.—The perfect form of the chest in an athletic person is well shown in diagram 11. There the lateral bulges of the chest are greatest over the lower edges of the lungs, and the upper boundaries of the liver, stomach, and spleen. The walls gradually project more and more down to these bulges, and slope inwards more and more below them to the eleventh costal cartilage; a perfect convex curve, a complete lateral arch, is formed on each side.

Form of the Chest in the Sedentary.—The chest of the sedentary, ill-fed, badly-lodged mechanic, is much less developed than that of the robust farm-labourer. In the former, the chest is narrow, the sternum and costal cartilages are flat, the ribs fall in on the sides and do not project over the lungs; the angle between the opposed sixth, seventh, and eighth costal cartilages is acute, the abdominal viscera are large in proportion to the thoracic, and the abdomen projects; the diaphragm descends nearly as low as it does in the robust.

Form of the Chest in the Robust.—In the robust, on the other hand, the chest is broad, the sternum and costal cartilages come boldly forward, the ribs project at the side and are rounded; the angle between the opposed sixth, seventh, and eighth cartilages is large. The abdominal viscera are small in proportion to the thoracic; the abdomen is spare, and the diaphragm descends a little lower than it does in the sedentary and narrow-chested.

Excessive abdominal distension pushes further apart the opposite lower ribs, while it protrudes the belly, pushes up the diaphragm, and thrusts outwards and forwards the costal cartilages of the sixth, seventh, and eighth ribs.

In the formed Adult, the lower end of the Sternum advances further than the upper.—In the formed adult, where the bones are consolidated, and the cartilages unyielding, the lower end of the sternum advances during inspiration as far as, nay farther than, the upper.

In old age the Costal Walls nearly a solid bony framework.—The costal walls of the old man form one solid bony framework; the ossified cartilages yield very little, and the movements of the ribs on each other are very slight.

The lungs are enlarged, their inferior margins are lowered, the lower end of the sternum and xyphoid cartilage, and the costal cartilages of the sixth, seventh, and eighth ribs, project.

On a deep inspiration the sternum and inferior costal cartilages of this scarcely moveable framework advance more and more, the further they are from the upper part of the chest, from the main axis of motion.

The seat of the depression that was formed in youthful life over the meeting of the thoracic and abdominal organs remains. As the lower margin of the lung and lower bound of the heart descend below that depression, the former, and not the present, seat of those boundaries is really indicated by it.

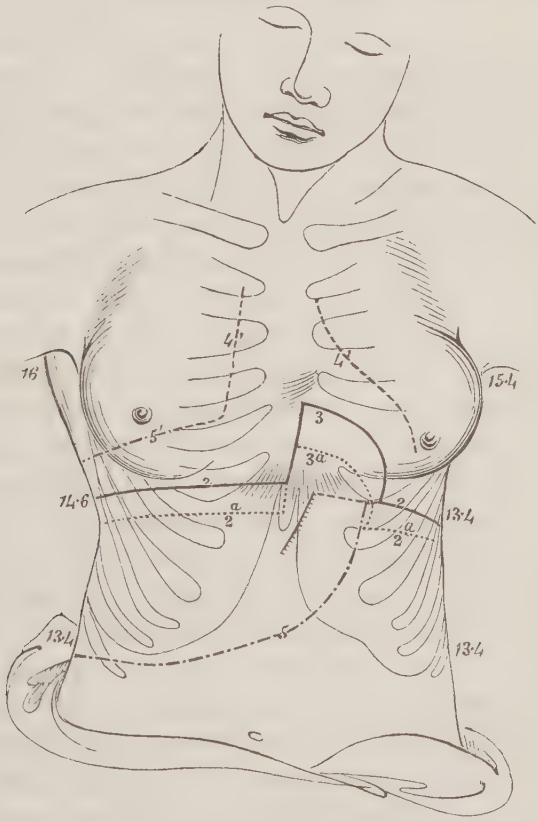
IN THE FEMALE. (DIAGRAM L. 2.)

Contrast of the Male and Female.—The female form, that in girlhood so closely resembles that of the boy, at the age of puberty rapidly springs forward in a quite different development. The framework of man gradually becomes more pronounced, robust, and angular. The form of woman, on the other hand, becomes rounded and sloping; the outline is everywhere softened in graceful curves. The surface is not so well marked with the stamp of the inner organs as in man; but though the sharp outlines of those organs cannot be seen so well, their general features are perfectly palpable.

The Female form is modified by tight lacing.—It is, unfortunately, not the natural female form that we, as medical men, have to examine, but that beautiful form, pressed in here and thrust out there by the habit of tight lacing. The connoisseur and the physician agree that the form of the Medicean Venus is perfect. Compare the soft sloping outline of that figure with the abrupt angles, the sudden tightening and swelling of the "fine figure" of the present day. A terrible fashion compels women to distort nature, or be branded as deformed. Diagrams 9, and L. 2 and 13, exhibit the form of woman moulded by tight lacing; and diagram 3 and the ancient statuary show that form in its natural development. In the latter the ribs have a natural bulge at the side, and slope gradually and gracefully to the lower ribs. The lower lobes of the lungs are permitted to play, the liver and stomach have their natural form and seat. In the stay-moulded female the com-

L. 2.—HEALTHY ADULT FEMALE.

HANNAH CUTLER, AGED 33, SERVANT, PATIENT OF MR. WHITE; VARICOSE VEINS OF THE LEG.



2. Lower margins of the lungs, in a tranquil state, behind the fifth intercostal space, p. 316; 2 *a*. Lower margins of the lungs, on deep inspiration, descend to the sixth rib, p. 362.—3. Heart's superficial dulness, in a tranquil state, p. 315; 3 *a*. Heart's superficial dulness, on deep inspiration, lowered and narrowed, p. 365. 4'. Boundaries of the heart's deep-seated dulness, p. 322.—5'. Upper deep bound of the liver, pp. 334–5; 5. Liver, p. 362.

The shading just above the lower bounds of the right lung and the heart indicates the seat of the respective depressions over those boundaries.

The figures at the sides denote the *measurements* on each side, from the spine to the centre in front, under the *axilla*, over the *lower margins of the lungs*, and over the *lowest edge of the ribs* and their cartilages.

pass of the ribs is positively so girt that it is the narrowest where it ought to be the broadest. The opposed lower edges of the sixth, seventh, and eighth costal cartilages, below the sternum, are crowded close to one another, and during inspiration are not allowed to separate. From the narrowest part the costal walls expand outwards to the lower ribs, so as to be actually the broadest where they ought to be the most narrow.

Effects on the Lungs and Heart.—The lower lobes of the lung are not allowed to expand; the descent of the diaphragm is interfered with, the extension of its floor is absolutely prevented. The expansion of the lower lobes of the lung being interrupted, the upper lobes are unnaturally expanded by an excessive raising of the first and second ribs and the sternum. The upper part of the chest projects rapidly and boldly, and the modern "fine bust" is produced, so different from that graceful slope, the impress of which is left us as a legacy by the masters of old, who moulded from uncompressed nature. The heart is not allowed its free natural play.

Effects on the Abdominal Viscera.—The liver is girt round, so that it often has an hour-glass contraction; (diagram 9;) and as it is expelled from its usual seat, that organ is thrust forwards and downwards, so that a very large portion of it is below the costal cartilages, quite unprotected by the ribs, and imperfectly influenced by their motions. The liver and the intestines are pushed down so as to distend the abdomen, which bulges forwards, and swells outwards on each side below the ribs instead of sloping inwards. The stomach shares with the liver in the general crushing process.

Effects of tight lacing on the health.—Can we wonder that the sex suffers from shortness of breath, palpitation, indigestion, hysteria, and a host of maladies, that, though not immediately fatalto life, are destructive to sound health?

Between the ages of 15 and 30, the very time that tight lacing tells, the deaths of females are more, by 13 per cent., than the deaths of males. Eight per cent. more females than males die of consumption. Is not this habit of tight lacing one of the causes of this excessive mortality?

An illustrious lady, who is counselled by a sensible medical adviser, now rains healthy influence on the domestic manners of the day; may we not hope that in the Princesses a laudable example will be set of healthy natural training?

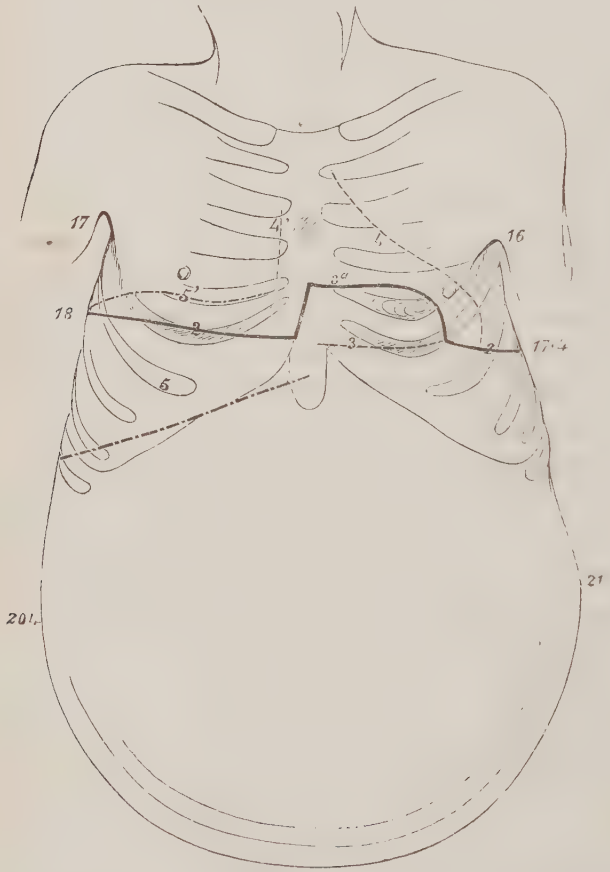
Tight lacing does not altogether obliterate the outline marks on the surface of the internal organs: the depression is still marked over the lower boundaries of the lungs and heart, and the eye can usually define those boundaries; but by no means with the precision with which they may be observed in girlhood. About the age of 12 or 13 the female figure is changed by lacing; at that time the alteration is very rapid; and by the age of 15 the form has received the current stamp of the day.

Effects of Abdominal Distension.—Abdominal distension, from whatever cause, while it thrusts up the diaphragm, and compresses the lungs and heart upwards, (see pp. 342–6,) modifies the form of the whole body.

The extreme effect of distension is shown in diagram L. 3. The diaphragm is pushed up. The

L. 3.—EXCESSIVE ABDOMINAL DISTENSION.

FREDERICK GREEN, AGED 43, PATIENT OF DR. STORER; DISEASE OF HEART AND AORTIC VALVE; ASCITES.



2. Lower margins of the lungs pushed up by abdominal distension, p. 344.—3. Heart's superficial dulness; seat of impulse shown in fourth intercostal space.—4'. Boundaries of the heart's deep-seated dulness.—5'. Upper deep boundary of the liver pushed up by abdominal distension.—5. Liver.

The figures at the sides denote the *measurements* on each sides, from the spine to the centre in front, under the *axilla*, over the *lower margins of the lungs*, and over the *lowest edge of the ribs* and their cartilages.

For a general description of this case see pp. 397–99.

lower ribs, and sixth, seventh, and eighth costal cartilages, are pushed outwards to a great extent. The angle between the opposed sixth, seventh, and eighth ribs is greatly increased, being very obtuse. The sixth and seventh costal cartilages project forwards; and there is a depression at the fifth rib, coinciding with the lower boundaries of the right lung and the heart, and the upper bound of abdominal distension.

The depression below the heart is lower down than, and is not so deep as, that below the margin of the right lung. The third, fourth, and fifth left costal cartilages over the heart project more, and their projection is broader than the corresponding cartilages over the right lung. The xyphoid cartilage is thrust strongly forward; the integuments press up on each side of it. The body assumes in many respects the form of the infant or child.

This illustration affords a good example of the influence of abdominal distension on the internal organs and on their outer mould. The varieties in other cases are more in degree than in character.*

* "To Dr. Harrison is due the merit not only of having pointed out the elevated situation of the liver in the healthy condition of the chest, but also the slight but perceptible fulness on the right side, caused by the presence of this organ. The slight depression below corresponds to the thin portion of the right lobe, as the still slighter one immediately above does to the passing inwards of the diaphragm in its course to the cordiform tendon." ..... "These irregularities are subject to modifications, partly dependent upon the natural figure of the chest and partly on modifying causes which have exerted an influence upon it. Perhaps the most important as well as the most common of these, is that which is due to the forcible compression of stays, to which females perniciously subject themselves, from a very erroneous notion that they are thereby improving their shape."—From Dr. Hodgkin's *MS. Notes for the Conversazione at St. Thomas's Hospital.* (See page 308.)

Measurement of the Chest.—The positive diameter of the chest is usually greatest over the lower margins of the lungs, which margins are usually pushed out by the liver on the right side, by the stomach and spleen on the left. The liver is, generally, more bulky than the combined stomach and spleen; the base of the right lung is more extended than that of the left. The measurement from the sternum to the vertebræ over the lower margin of the right lung, is, in the very great majority of persons, greater than that over the lower margin of the left.

In Children Abdominal measurement greater than Thoracic; right and left side equal.—In children the abdominal organs yield to the pressure of each other in every direction, and are, in comparison with the thoracic viscera, much developed. The measurement over the lower margin of the lung, (the two sides of the chest seldom differ,) is, in comparison with that round the chest under the axilla, greater than in the adult; the former measurement being positively larger than the latter, notwithstanding that the scapulæ and pectoral muscles are included.

The measurement round the abdomen, near the lower edge of the costal cartilages, is even greater than that over the lower margins of the lungs.

The relative proportion of the measurements alters as the child grows, and as the disproportion between the size of the abdominal and thoracic organs diminishes. About the age of six, the measurement over the axilla, that over the lower margin of the lungs, and that over the lowest rib, are nearly equal; there is very little difference between the two sides.

About the age of 11 or 12 the difference of sex, and the habits of life begin to tell.

In the boy and girl the Chest measurement is greater than the Abdominal.—In both boy and girl the measurement over the lower margin of the right lung is greater than it is over that of the left; in both, too, is the measurement over the lower ribs less than that over the lower margin of the lung; and this measurement is again less than that below the axilla. In the boy, especially the country labourer, the abdominal measurement is much smaller than the middle thoracic.

The upper and lower measurements are usually equal on each side. In one boy, immediately after a hearty distending meal, the middle measurement of the chest was greater on the left, than on the right side.

Adult Male.—In the full-grown young man the measurement over the lower margin of the right lung is usually half an inch greater than it is over that of the left. The measurement over the scapulæ is about an inch longer than that over the base of the lungs.

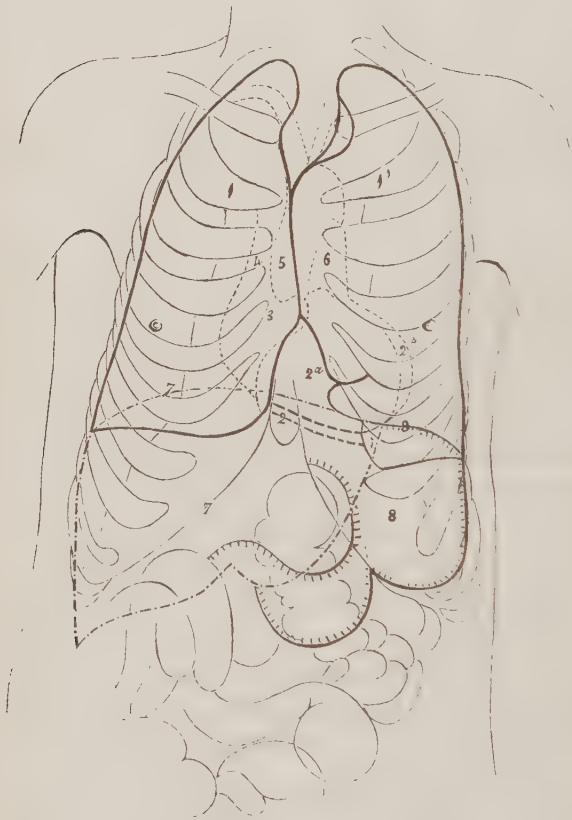
Below the middle measurement the costal walls slope in; over the lowest costal cartilage the whole girt is about one-fifth less in the athletic labourer, and one-tenth less in the mechanic, than it is over the lower margin of the lung.

Old Age.—In the old man the whole framework of the chest is larger, and the abdomen is more distended than in the middle-aged.

In Women.—In women the right side is usually the largest; the abdominal measurement is but little smaller than the middle thoracic.

14.—EMPHYSEMA.

MATTHEW HUDSON, AGED 44, PATIENT OF DR. HUTCHINSON; ENLARGEMENT AND DISEASE OF RIGHT VENTRICLE, EMPHYSEMA, AND ASCITES.



1. Right lung; 1'. Left lung.—2*a*. Right ventricle much enlarged; 2*b*. Left ventricle.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.

The diaphragm is abnormally low, the lungs and heart are drawn down, and the abdominal organs are pushed down below the healthy sites. (See pp. 404, 405, 409, and 410.)

DISEASES OF THE LUNGS WHERE THE BULK OF BOTH LUNGS IS ENLARGED.

EMPHYSEMA. (DIAGRAMS 14, 20, L. 4.)

This is emphatically the disease in which there is a constant, excessive, deep inspiration. The inspiration is constantly deeper than it is possible, with any effort, for a healthy man to take.

Change of Structure.—All the air-cells are permanently enlarged and distended. The cells forming the mass of the lung are simply enlarged; the partitions of the lobules usually remain entire. The areolar or cellular tissue occupying each lobule becomes coarser; the webbed partitions of the cells being more extended, the thread-like interlacements more lengthened, than they are in a state of health.

The thin margins of the lungs over the heart and great vessels, and, to a less extent, those over the outer circuit of the diaphragm, become thick and irregularly rounded in globular bulges. The air cells are excessively and unequally enlarged; the interlobular partitions are here and there perforated, and the lobules communicate freely. The webbed structure of the cells disappears, and is entirely replaced by a lengthened thread-like interlacement; some of the interlobular walls are engrossed in this filamentous structure.

Each filament consists of a single straight capillary; where several filaments meet the capillaries

form a net-like, sometimes a tortuous, interlacement. The capillaries on the webbed structure are usually very fine, equal in size, and reticular; sometimes they are of unequal size, bulging, and tortuous. In extreme cases the interlobular structure is everywhere perforated.

The outer tissue of the lung is usually attenuated, and its whole structure dry, pale, and bloodless. Sometimes the protruding cells have their pleural wall thick and fibrous; in one specimen, (diagram 14,) the walls of some of the lobules were entire, and partook of this thickened structure; one lobule was closed, and contained dark fluid. The fibrous outer walls did not receive injection, though the minute capillaries of the cellular structure did. The bronchial tubes, near the emphysematous structure, were excessively and irregularly dilated; they narrowed and became very fine where they opened into the dilated lobules, the openings, indeed, could not easily be detected.

Though the walls of the lobules be perforated, and though the cellular structure, be elongated and filamentous, yet no mark of laceration is ever seen in "lobular emphysema." The attenuation and disappearance of the tissue is a modification in the cell-life and vascularity of the structure.

The above observations, so far as they go, confirm the view of Dr. Hodgkin, that emphysema is an atrophous, and not, as Andral states, a hypertrophous disease.

Though the minute structure of the lung is dry, and contains less blood and fewer capillaries than in the healthy state, I have found the pulmonary

artery and the pulmonary veins enlarged, and the branches of the pulmonary vessels much dilated and their walls attenuated

The bronchial tubes are, so far as I have seen, usually dilated. Their inner walls were, in the subject of diagram 14, thickened, their capillaries were reticular and large. In a specimen from diagram 20, the capillaries were remarkably irregular in size, forming fine tortuous interlacements, or papillary elevations; here there was existing bronchitis. In another specimen, where the cellular dilatation was enormous, the walls of the much and irregularly dilated bronchial tubes were exceedingly thin. In this specimen the capillary interlacements were remarkably fine, the inner walls of many of the capillaries gradually approached, rendering the tubes finer, until at length they came in contact, and obliterated the vessels.

The communications of the dilated cells with the bronchial tubes are very small in comparison with the size of the cells; this circumstance, and the dry condition of the lungs, account, in a great degree, for the non collapse of the lungs under atmospheric pressure, and for the slowness and difficulty of the expiration.

External signs of Emphysema, those of an excessive inspiration.—Every external visible sign of emphysema is an exaggeration of the deepest possible inspiration. (Diagrams 14, 15, 20, and L. 4.)

The upper part of the Chest is expanded and rounded.—The first and second ribs at the sternal end, and the sternum, are pushed forward and

raised. The outer curves of all the ribs are raised and protruded at the sides. The sternal ends of the upper ribs and the costal cartilages are drawn up. The protuberances in front, formed by them to each side of the sternum, go boldly forwards; the costal cartilages are nearly all at right angles with the sternum, and the sternum itself protrudes gradually forwards from the upper nearly to the lower end; there it usually falls in; the free end of the xyphoid cartilage usually juts forward.

The Apex of the Lung is not so far above the Clavicle as in health.—The summits of the lungs are raised, but not so much as the clavicles; the apex of the lung does not, consequently, rise so high above the clavicle, as it does in the healthy state. The whole upper part of the chest is swelled out, rounded, and projecting; the upper lobes of the lungs are everywhere greatly expanded.

Dilatation of the lower part of the Chest.—The cartilaginous ends of the sixth, seventh, and eighth ribs are raised, their cartilages are drawn upwards, and the angle formed between their opposed inferior margins, below the sternum, is enlarged. The outer curves of these, and of the ninth, tenth, and eleventh ribs, project, but not so far as do those of the upper. Each of the lower ribs is withdrawn from that below it; whereas each of the upper ribs approaches that above it. The posterior angles of the inferior ribs project backwards.

The Diaphragm and Lower margins of the Lungs.—The diaphragm is everywhere very much lowered and flattened, the lower margins of the lungs being in front, behind the sixth intercostal space, or the

seventh rib. The lower inner front margin of the right lung, and the lower bound of the heart, are drawn down by the diaphragm, so as to be behind the lower end of the xyphoid cartilage; sometimes these boundaries are quite below that cartilage. To the side, the lower margins of the lungs slope gradually outwards and downwards, above or just behind the junction of the ribs to their cartilages; at the back they are just below the lower edge of the twelfth rib.

The lungs never reach these extreme limits in the healthy person, on the deepest inspiration; (diagrams L. 1 and 2;) and they can scarcely ever be reached by the utmost artificial distension of the lung in the dead body. (Diagrams 6, 11, 12, and 13.)

The thin wedge of the Lung fronting the Heart and great Vessels is greatly dilated.—As the outer coats of the lungs are more yielding than the walls of the heart, the lungs are much more distended than the heart. As the walls of the chest are greatly advanced, the thin margins of the lungs come foward, jut in between the front walls of the chest and the heart, and have their thin wedge-like margins stretched, thickened, dragged forward, and rounded by the ever-recurring attempts at a deep inspiration, and by the difficulty of escape for the air from the enlarged lobules through the narrowed bronchial outlets, during an expiration.

The lower margins of the Lungs are much dilated; not so much as the Sternal.—The excessive lowering and flattening of the diaphragm lowers, brings down, and enlarges the whole base of the lungs, and every

where stretches the substance of the lower lobe ; but particularly expands their thin lower margins, which are rendered blunt and rounded, like the sternal margin. As the sternal margin of the lung is thinner and more film-like than the lower margin, and as its expansion is greater owing to the excess of the separation of the sternum from the heart, over that of the lower ribs from the floor of the diaphragm, the sternal margin of each lung is more expanded, rounded, and stretched, than the lower margin.

Space of Heart's dulness narrow, and below the Sternum.—The crowding in of the lungs in front of the heart, completely screens that organ from the ribs and all the costal cartilages, except the conjoined sixth and seventh, just below the sternum. The only portion of the heart that touches the costal parietes is the lower part of the right ventricle, which is immediately behind the right side of the xyphoid cartilage and the conjoined sixth and seventh costal cartilages. (Diagrams 14 and L. 4.) In the most extreme cases of emphysema the region of the heart's superficial dulness is never obliterated. If there be no disease nor excessive enlargement of the heart, the space is usually two inches in extent from right to left, and one inch and-a-half from above downwards ; when the heart is very large the region of its superficial dulness is increased.

Enlargement and descent of the Heart.—In all cases of emphysema, the heart is enlarged, and its right cavities are distended. The expansion of the chest tends to enlarge the heart, and the resistance to the flow of blood through the lungs has in addition a reactive dilating power on the right cavities.

The descent of the diaphragm causes the descent of the lower boundary of the heart. The right ventricle is drawn down from its usual place, behind the lower half of the sternum, so far, that it is behind the xyphoid cartilage and the lowest portion of the sternum.

Every part of the heart is necessarily lowered when its right ventricle and auricle are brought down. (Diagram 14.) The pulmonic and aortic valves are lowered, so that the former, are behind the fourth left costal cartilage, and the latter, behind the sternum, just below the level of the former valves. The pulmonary artery is lengthened, the aorta is dragged down, the turn of its arch is sharpened, the innominata is lowered, and, the sternum being raised, is entirely within the chest, behind the sternum, and quite out of the surgeon's reach.

The right ventricle being more enlarged than the left, its left border extends outwards almost to the left boundary of the heart, as in diagram 14, where the apex of the left ventricle, is quite masked in front by the tip of the right, and where a very small portion of the left ventricle, is seen jutting to the outside of the right.

Descent of the Abdominal Organs.—From the inspiratory flattening of the diaphragm, the upper bulges of the liver, stomach, and spleen, are more depressed, in proportion, than the lower margin of the lungs. (See diagrams 14 and L. 4, where the liver's summit is behind the fifth instead of the third intercostal space.)

The left extremity of the liver extends far to the

left, the lower border is remarkably low, both below the xyphoid cartilage and at the right side below the eleventh rib. (Diagrams 14 and L. 1.) This unusual lowness of margin exists often where the liver is not enlarged, (diagram 14,) as the lower border necessarily partakes of the displacement downwards of the whole organ. The liver, stomach, spleen, pancreas, kidneys, and intestines, are all unusually low, being pushed downwards by the diaphragm. The abdomen is more distended, even relatively to the amplified chest, than it is in health.

In tight-laced females the lower Lobes of the Lungs are not much dilated; and do not descend much.—When emphysema affects the female, the long-continued constriction of the lower lobes of the lungs, effected by tight lacing, prevents those lobes from being so much enlarged by the affection as the upper. The diaphragm, the lower margin of the lungs, and the heart, do not descend so low in the female, as they do in the male patient.

Upper Lobes necessarily developed.—The upper lobes of the lungs and the upper part of the chest are, on the other hand, more developed in the female than in the male.

In the subject of diagram 14, the abdomen was unusually distended by the effusion of serum, and by intestinal distension. The descent of the diaphragm was therefore not so great, as it was before it was pushed up by that distension. From the same cause the full expansion of the chest has been prevented. The ribs are not raised so far as they usually are in emphysema. (See diagrams 15 and L. 4 for the customary position of the ribs.)

Form of the Surface.—As the fourth, fifth, and sixth left costal cartilages are quite in advance of the heart, the lung being interposed, those cartilages are scarcely more prominent than their fellows on the right side. The little difference that exists, is due to the unobliterated impression of the heart, made during the previous healthy life.

The liver too is completely thrust down below the lungs, which are themselves expanded, so that each lung exceeds the bulk of either the liver or stomach. There is no lateral liver or stomach bulge. The stamp of the old depression frequently still remains; but it is of course far above the present lower margins of the lungs or heart. This almost worn-out impression tells where the lower boundaries of the lungs and heart were in health, and affords us a measure of the extent to which disease has brought down these boundaries.

In some persons there is a new and very slight depression formed over the lowered inferior bounds of the lungs and heart.

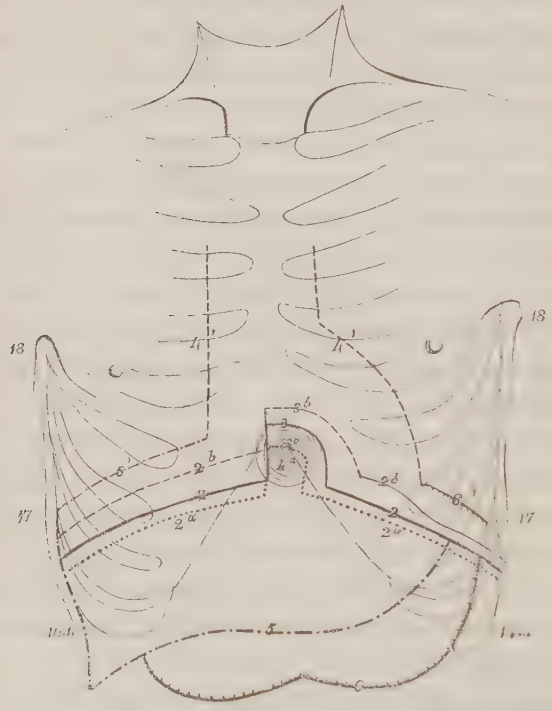
Measurement.—The right and left sides are almost always equal. The measurement round the abdomen is greater in comparison to the upper measurement than it is in a state of health. All the measurements are greatly increased.

Effects of Inspiration.—The subjects of this disdisease are, even in the most tranquil state, almost "at the top of their wind." The chest is so full, that the strongest efforts can add little to the already distended cavity.

When in the state of perfect rest the ordinary

L. 4.—EMPHYSEMA.

BENJAMIN LOWE, LABOURER, AGED 40, PATIENT OF DR. HUTCHINSON.



Comparison with Health.—The sternum, clavicles, and ribs, and their cartilages, are all raised, pp. 405–6.—The whole chest is amplified, pp. 405–6.—The diaphragm, 2, 5', 6', is two ribs' breadths lower, pp. 406–7.—The left side of the chest equals the right in measurement, p. 411.—The summits of the lungs not so high above the clavicles, p. 406.—The lower end of the sternum falls back on inspiration, pp. 413–14.

2. Lower edges of the lungs, in a tranquil state, behind the seventh ribs, pp. 406–7; 2 *a*. Lower edges of the lungs, on a deep inspiration, half a rib's breadth lower, pp. 413–15; 2 *b*. Lower edges of the lungs, on a forcible expiration, behind the sixth ribs or sixth intercostal spaces, p. 415.—3. Heart's superficial dulness, in a tranquil state, low and narrow; below the sternum, behind the xyphoid cartilage and sixth and seventh costal cartilages, pp. 408–17; 3 *a*. Heart's superficial dulness, on deep inspiration, descends into epigastrium, and becomes narrower, p. 417; 3 *b*. Heart's superficial dulness, on forcible expiration, ascends behind the lower

inspiratory muscles act with unusual power; and some of the supplementary muscles, as the sterno-cleido-mastoid, give their aid. The diaphragm acts with particular vigour; and as its floor is already flattened, the descent of its whole plane is immediate and effective. No time is lost by it in flattening its bulge. The scaleni and superior intercostals at the same time draw upwards and push a little forwards the superior ribs, their cartilages, and sternum.

The lower part of the sternum, the xyphoid cartilage, and the sixth, seventh, and eighth ribs and cartilages are raised, but fall in, instead of advancing, at the beginning of the inspiration. This depression of these parts is marked, and is due to the sudden withdrawal of the lungs, caused by the rapid descent of the diaphragm, which draws down the bases of the lungs before the air has had time to rush in through the tubes to supply the displacement. Atmospheric pressure forces back the costal walls.

end of sternum, and becomes wider, p. 417.—4'. Bounds of heart's deep-seated dulness, lower and more extensive; 4 *a*. Concentric curves: Heart's impulse in a tranquil state; impulse of right ventricle felt over the xyphoid cartilage; impulse at apex not felt, p. 418; Heart's impulse, on deep inspiration, lower, stronger, and more extensive, p. 418; Heart's impulse, on forcible expiration; impulse of right ventricle, feeble, sternal, or unfelt; impulse at apex, feeble, fifth or sixth intercostal space, p. 418.—5'. Upper deep bound of the liver, behind fifth intercostal space; lower, in proproportion, than the lower margin of the right lung, pp. 409–10; 5. Liver, and 6. Stomach, are pushed down into the abdomen, which they distend, p. 409–10; the measurement of the abdomen is usually large, p. 411; 6'. Upper deep bound of the stomach, behind the sixth intercostal space.

Resonance, on percussion, loud and extensive; Vocal resonance, loud and extensive; Laryngeal respiratory sounds, loud and hissing, p. 415; Respiratory sounds over the bulk of the lung, feeble, p. 416; Respiratory sounds over the sternal margins of the lungs, loud and hissing, p. 416.

The figures at the sides denote the *measurements* on each side, from the spine to the centre in front, under the *axilla*, over the *lower margins of the lungs*, and over the *lowest edge* of the ribs and their costal cartilages, p. 411.

Towards the end of the inspiration, as soon as the lungs have had time to be filled up to the action of the diaphragm, the lower portions of the costal walls in question, advance, and by the end of the act are more prominent than they were before the beginning. In some cases the sudden withdrawal, by the diaphragm, of the lung from behind the sterno-costal walls, causes the whole of these walls to fall back, at the same time that they are raised by their proper muscles. The upper part of the costal walls very rapidly recoils and protrudes.

During a deep inspiration every available muscle is called into play. The lower parts of the costo-sternal walls fall back at the beginning of the act; but they very soon resume their place, and then advance steadily; and as the framework of the chest is usually solid, the advance of the xyphoid cartilage and lower part of the sternum, and of the sixth, seventh, and eighth costal cartilages, is actually greater than the advance of the upper part of the sternum and of the higher ribs and cartilages; these lower parts being further from the axis of motion.

When the lower face of the sterno-costal walls advances, the opposed lower edges of the combined seventh and eighth costal cartilages below the sternum are withdrawn from each other, and the angle between them is enlarged.

Fit of Dyspnœa.—During an attack of dyspnœa the patient fixes the scapulæ, thus giving solid points of action to the pectoral muscles, by resting the hands on a table, or the elbows on the knees, the head and shoulders being at the same time thrown forwards.

If the patient is in bed he frequently kneels and

leans on his elbows, maintaining a horizontal back; this is the very attitude of the lower animals. There is now no occasion to lift up the thoracic walls on inspiration; the motion is backwards and forwards, like that of a battering ram, and the costal walls are slung by the serrati from the scapulæ, fixed by the rhomboidei. The action of the serrati, when exerted on the ribs, is not inspiratory, but expiratory; so that expiratory action is also assisted. The head at the same time is lowered, resting on the pillow; the origins of the scaleni and of the sterno-mastoid are thrown forwards and fixed, and those muscles act with every advantage; their pull being direct, not oblique, none of their force is lost.

Expiration—Expiration is performed very slowly. I think the act of expiration doubles in duration that of inspiration; this is, I conceive, due to the dry, parchment-like state of the lung tissue, and to the outlets from the distended cells or lobules being comparatively small.

The muscles of expiration are always strongly exerted. At the beginning of the act of expiration the whole floor of the diaphragm is suddenly raised, the whole volume of the lung is compressed, and as the air goes slowly out of the tubes the costo-sternal walls are displaced forwards, just as they are when the respiration is entirely diaphragmatic. The costal walls soon return to their former level, and they then fall in.

Respiratory sounds.—The laryngeal respiratory sounds are loud, smooth, and hissing; the expiratory sound has exactly the same character, and is as loud and intense as the inspiratory.

Over the upper part of the sternum, and just below the clavicles, the expiratory and inspiratory sounds are hissing, and resemble those heard over the larynx, from which indeed they, especially the inspiratory, are probably carried. Over the bulk of the lungs, to the sides, and behind, the respiratory sounds are very faint, often scarcely audible; over the inner margins of both lungs, from the upper to the lower end of the sternum, there is usually a rather loud inspiratory hissing murmur, resembling the laryngeal noise, The expiratory sound is quite audible, of similar character, but not so loud.

When the respiration is quickened the sounds are louder. The act of expiration often gives birth to a very gentle sharp coo, or whistle; this begins suddenly; it is loud at the beginning of the act, gradually dies away, and gives place to the hissing murmur.

The hissing murmurs which are heard over the sternum from end to end, and more faintly also around the heart, and over the lower margins of the lungs in front, are probably due to the rushing of the air through a narrow opening into and out of the enormously dilated cavities. The sounds are heard where the air-cells and lobules are most dilated, and where there is the greatest difference between the calibre of the opening and the size of the cavity. The contrast is strange between the comparative silence over the bulk of the lung and the rushing hisses over the stretched dilated margins. They cannot be due to the conveyance of the laryngeal sounds, else would those sounds be heard louder still over the bulk of the lung.

Do they arise from the friction of the lung's surface, of the rounded projecting lobules, against the costal walls? If so, would not the sound diminish towards the end of the act, when the motion of the lungs is little more than dilating, and scarcely from above downwards, or from side to side?

The expiratory sound though of like quality with, is fainter than the inspiratory; this is due to the slowness of the act of expiration. The respiratory noises are frequently accompanied by sonorous noises, due to the secretion and accumulation of mucus in the air-passages, and to accompanying bronchiti s.

Seat of Heart's dulness.—The region of the heart's superficial dulness is just behind the left side of the xyphoid cartilage and the conjoined sixth and seventh left costal cartilages. This region is lowered and narrowed during a deep inspiration, its upper edge (diagram L. 1) being brought down from the top to the middle of the xyphoid cartilage; its lower end is below that cartilage, and the left margin is just behind the inner edge of the sixth and seventh left costal cartilages, The region of the heart's contact is, in fact, entirely in the epigastrium.

A deep expiration raises and widens the region of the heart's dulness. (Diagram 4.) It is brought behind the lower end of the sternum, both sides of the upper half of the xyphoid cartilage, and the sixth and seventh costal cartilages at their sternal junction.

The lung is everywhere thinner over the heart; the region of the heart's deep dulness is much

extended, the degree of dulness is greatly increased.

Seat of Impulse.—The impulse, if present, occupies the same seat as the region of the heart's superficial dulness, being situated in the epigastric region, just below the sternum; it is usually very gentle, heaving, diffused; lasts a very short time, and falls back suddenly; there is often, where the impulse cannot be felt, a visible undulation to the left of the xyphoid cartilage. The suddenness and quickness of the fall back gives the impression that there is a falling in during the systole, instead of a heaving. By the combined assistance of the flexible stethoscope, the eye, and the touch, a little attention shows that there is a heaving impulse at the beginning of the systole, and a falling back during its progress.

On a deep inspiration the impulse is lowered quite into the epigastrium, below the xyphoid cartilage and the edge of the sixth and seventh costal cartilages, it is strong heaving, falls suddenly back, and is not altered in character from the impulse in a state of repose. The influence of the impulse is more readily conveyed through the muscular than the bony walls, and the heart too is pressed on by the walls during inspiration, as they are pressed back upon the heart at the beginning of the inspiratory act while the heart heaves forward. The impulse can very seldom be felt during expiration; sometimes it is perceptible to the eye and touch, especially if the case be not extreme, between the fifth and sixth ribs; sometimes there is a very gentle heaving of the sternum.

Heart's sounds.—The heart's sounds are heard over a very limited extent when the patient is at

rest. The impulsive sounds are only heard over the region of dulness in front of the xyphoid cartilage, and sixth and seventh costal cartilages; the sounds are very faint, often inaudible, on the upper part of the sternum; the second sound is heard very plainly just above the junction of the right clavicle to the sternum.

Effect of Inspiration on the Heart's sounds.—On a deep inspiration the sounds are lowered, with the region of the heart's dulness and impulse, into the epigastrium. The systolic impulsive sound is louder and more ringing than it is in the tranquil state; this is, probably, due to the falling in of the sterno-costal walls over the heart while that organ advances. The diastolic sound is generally louder, sharper, and more ringing, than the systolic, or than the usual second sound. The systolic and the diastolic impulsive sounds are only heard over, and immediately contiguous to, the seat of the heart's dulness.

Effect of Expiration on the Heart's sounds.—On a deep expiration the impulsive sounds are loud and ringing, and are heard much more extensively, quite over the enlarged space of the heart's dulness, and to some extent over the neighbouring surface. The systolic impulsive sound of the apex, before quite inaudible, is now generally heard loud, sharp, and ringing, between the fifth and sixth ribs.

The normal first and second sounds are now very plainly heard over the whole sternum, and over and beyond the whole region of the heart's deep dulness; they can also be heard over the dorsum. In examining the character of the heart's sounds to

ascertain whether there be valvular murmurs, it is necessary to listen during a deep expiration. During the ordinary play of respiration the sounds are higher and more extensive on expiration, and lower and less extensive on inspiration. During the former they are loudest over the sternum and apex; during the latter, over the epigastrium.

Respirations.—The respirations are generally natural in number, or even less frequent than usual, if there be no bronchitis and if the patient be in a state of repose. Very often, especially if bronchitis be present, the respirations are quickened, being in the adult male about 24, in the female about 35 in the minute, when in the recumbent posture.

Pulse.—The pulse is almost always slow in male patients, even where the breathing is quick; it varies from 40 to 70 beats in a minute. In the female the pulse is quicker, from 80 to 90; the breathing also is, relatively to the pulse, quicker than in males. This great quickening of the respiration in females is, I doubt not, due to the modification that their lungs and chest have undergone by tight lacing, as the inspiratory increase of the lower lobes of the lungs is only allowed to take place partially.

The pulsation in the arteries of the neck and of the wrist is often visible even when there is no aortic regurgitation. The arteries usually contain little blood, consequently the injection of even a small quantity into the flaccid arteries produces a visible enlargement of their calibre.

Motion of the Blood through the Lungs and System.—The quantity of blood sent through the lungs is

small, consequently the rate at which it is sent through the system is slow; the pulse is feeble, the blood moves slowly in the veins. The distension of the superficial veins depends upon the activity of the capillary circulation.

Veins of the Neck.—The veins of the neck are usually swollen; in extreme cases excessively. A deep inspiration exhausts the blood from the cervical veins; a forcible expiration prevents the access of blood into the right side of the heart, while it increases the energy of the circulation through the system; the veins are then distended.

Jugular Pulsation.—The jugular pulsation is usually present, but is not well marked. The play of respiration is lessened in emphysema; there is less respiratory variation in the quantity of air in the lungs, and of blood in the lungs' vessels, and in the right cavities of the heart, than there is in the healthy state; consequently there is not the usual healthy range of ebb and flow in the venous reservoirs of the neck. The pulsation is usually more evident in the deep than in the superficial jugular veins; it is also more evident during expiration than in the natural state, unless that act leads to excessive distension.

Fulness of Veins.—If the veins are excessively distended or contain very little blood, there is no pulsation. Whatever causes moderate enlargement of the veins induces jugular pulsation. If they are excessively distended in a state of repose, a deep inspiration will moderate that distension and render the pulsation visible. If, on the other hand, the veins be nearly empty, or very flaccid, in a state of

rest, a forcible expiration will fill those veins and excite jugular pulsation.

Dyspnœa.—The dyspnœa, so distressing to the emphysematous patient, consists in a succession of attempts at inspiration, as rapid, forcible, and deep, as the physical condition of his breathing apparatus permits. This dyspnœa is really difficnlt inspiration; as the lungs are already distended almost to the full, very little more air can be admitted.

As there is very little unused lung kept in reserve for exertion, or for any other cause that hurries the breathing, the spare portion of lung is soon exhausted; excessive attempts at inspiration take place. Each inspiration further distends the lungs, as the air enters more easily than it can get out and thus the very attempt to remedy adds to the distress; and difficult breathing, in its real, full, and terrible import, is felt by the unfortunate patient.

Exciting causes of the Dyspnœa.—This difficulty in breathing is brought on by any cause that requires more blood to be arterialized than is needful in the tranquil state; by exertion of any kind, as quick walking, running, ascending or descending heights; by whatever increases the capillary circulation, as external heat, violent passion, or mental excitement; or the reaction after the chill and constriction of the surface with its capillary circulation. Any cause brings on the dyspnœa that excites increased and diseased secretion from the inner membrane of the air-tubes and air-cells, and thus lessens the action of the inspired air on the blood; as exposure to cold, and the breathing of an irritating atmosphere; whatever, also, injures the arterializing power of the

air breathed, as air charged with carbonic acid or other poisonous gas.

In extreme cases the recumbent posture brings on dyspnœa; this, I suppose, is due to the accumulation of blood by gravitation in the chest organs.

From whatever cause an attack or fit of difficult excessive inspiration is brought on, it does not give place to tranquil breathing until mucus is expectorated.

Exciting causes of Emphysema.—Emphysema may be brought on by all diseases that excite difficult and deep breathing; it is never a primary disease.

The difficult deep breathing that excites dilatation of the air-cells is very different from that breathlessness, shortness of breath, that obtains in hysteria, disordered excitability, and phthisis. The emphysema producing dyspnœa consists in repeated excessive acts of inspiration. In the hysterical dyspnœa there are numerous short acts of inspiration following one another in rapid succession; there is no attempt to distend the chest by a deep inspiration.

Bronchitis.—Among the causes of emphysema are bronchitis and repeated catarrh, affections of the bronchial and intra-lobular mucous membranes, which prevent the respired air from acting on the blood in the lungs' vessels, whether the coats of these vessels be altered, or whether they be screened from the air by a glazing of mucus. The patient naturally and unavoidably attempts to make up for the deficient arterialization of the blood by breathing as deeply and as often as he can.

When the disease of the bronchial mucous mem-

brane is of long duration, or of frequent occurrence, or when it leaves a permanently thickened state of the lining membrane, these acts of rapidly-recurring, forced, deep inspiration, gradually expand the lungs to the full natural extent, and then go on to stretch, step by step, the walls of the cells, equally in every direction in the mass of the lung, and partially with much greater force, at the thinned margins of the lungs. The cells so dilated have very narrow outlets. In bronchitis the tumid walls narrow or close the outlets; the air inspired is expired with difficulty; the whole is not ejected when the next inspiration begins, and that inspirations adds still more to the distending stock. Sometimes the lobules and cells are distended by fluid secretions from the inflamed surface, being detained by the closure of the opening, and then the accumulated secretion distends the secreting sac. The consequence is, that in the lapse of time the whole cell-texture of the lungs is rendered coarser, and at the margins the lobule walls are obliterated, the cells are infinitely stretched, and the fine areolar structure becomes distended into large bullæ, the sides of which are linked by filaments.

This new action is no laceration; the stretching excites a modified action in the cell-life and vascularity of the parts; all the old parts are extended, and many of them entirely disappear, being in fact removed by vital processes.

Diseases of the Heart.—Diseases of the heart, especially those which obstruct the circulation through the lungs, as mitral regurgitation and adhesions of the heart, usually give rise to emphysema. In dia-

gram 14, the muscular walls of the right side of the heart were rendered so firm and elastic by disease, that after being pressed together by the finger, they recoiled when the pressure was removed, as if they had been made of India rubber. In this case the right ventricle must have had hard work to send any of its contents into the vessels of the lungs. The patient would attempt to relieve this difficulty by excessive inspirations, during which blood would be forced into the expanding lungs' vessels by atmospheric pressure ; and, strange and far off as it may seem, by the action of the left ventricle, and by the return of the arteries after distension, through the arteries, capillaries, veins, right auricle, and right ventricle.

Frequent exposure to Foul Air.—Frequent exposure in pits to impure air, charged with carbonic acid or carburetted hydrogen gas, gives rise to repeated excessive deep inspirations, both in the pit, so long as the air is not entirely poisonous, and, to a still greater degree, afterwards, on exposure to the pure air. These excessive inspiratory acts gradually dilate the air-cells ; in addition, serious bronchitis is established, entailing all the emphysematous consequences of that disease.

Repeated excessive Exertion.—During repeated and excessive acts of exertion, especially running, or climbing, the full volume of blood is in active circulation, and is rapidly arterialized and consumed by the increased, repeated, deep forcible inspirations. These actions gradually stretch and enlarge the lungs.

Players on wind instruments expand the lungs to

the full before playing, that they may sustain the notes. Here the repeated action dilates the cells.

Emphysema, excited by laborious or running exertion, or by playing on wind instruments, is not, so far as I have seen, nearly so injurious to healthy life as when it is caused by bronchitis or by diseased heart.

Bronchitis is frequently induced by violent exercise, and by playing on wind instruments. Then is bronchitis combined with those causes in the production of emphysema, and then is there a real disease seriously disturbing the healthy functions.

Diseases of the Stomach and Liver.—Affections of the stomach and liver, caused as they generally are by a deranged condition of the skin, frequently give rise to repeated excessive attempts at a deep inspiration, and induce emphysema.

Emphysema an extension or later stage of a previous disease.—Emphysema is scarcely, I conceive, a distinct disease, but is one of the morbid conditions resulting from other diseases, or from repeated excessive inspirations excited by continuous labour.

Emphysema is, I conceive, the result, of repeated, irresistible, forcible, and vain attempts on the part of the patient to make up by deep inspirations for the deficiency in the arterialization of his blood; and of the difficulty in expelling the air from the already dilated cells through the narrow outlets. All the cases of emphysema that I have examined with care have sprung from bronchitis, exposure to coal-damp, or disease of the heart. In all those cases that originated in bronchitis, the skin was soft, loose-textured, perspirable, and susceptible of the influence of cold.

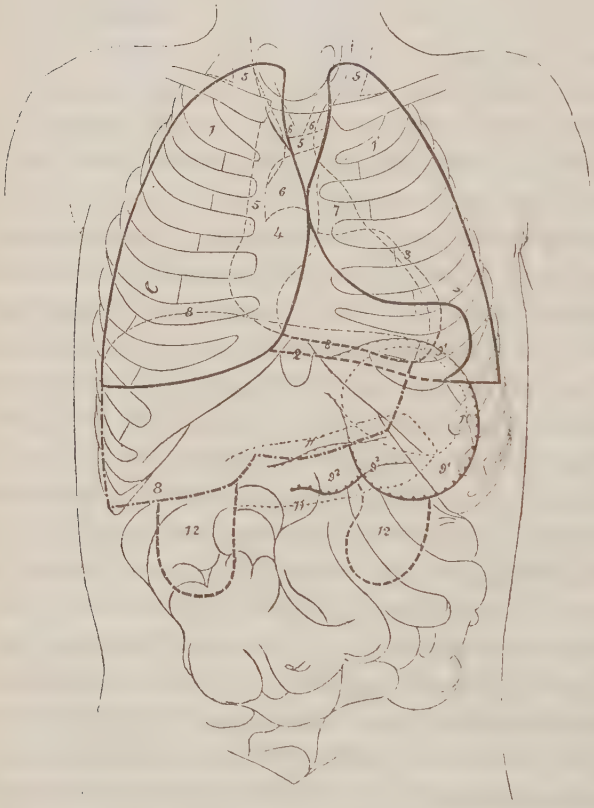
BRONCHITIS. (DIAGRAM 15.)

Bronchitis is the parent disease of emphysema. It gives rise to a constant inspiratory distension of the chest. The mucous membrane lining the bronchial tubes is tumid and red with new and increased vascularity and congestion, and secretes a diseased adhesive mucus in large quantity that glazes the secreting walls.

Microscopic changes observed in Bronchitis.—Diagram 15 was taken from a woman who died from fever with extensive bronchitis. The larger bronchial tubes were covered on their inner walls with irregular elevations, composed entirely of capillary vessels. The vessels were large and very irregular in calibre, the same vessel becoming suddenly two or three times its previous size, and then shrinking suddenly to a bore even less than it had at the first start. Some vessels were twisted spirally; others formed loops, rising forward; and between others irregular reticulations were formed by capillaries of ever-varying though small size. Covering one portion of this minutely injected tissue, there was an opalescent, soft, feebly organized structure, floating here and there in filamentous raggedness; under the microscope this structure was seen to consist of parallel bundles of exceedingly fine lines, each line being many times finer than a blood globule. The enlarged looped blood vessels played in a thick, soft, smooth, nearly translucent membrane. The vessels did not generally penetrate quite to the surface of this membrane; here and there one perforated it and was truncated.

15.—BRONCHITIS.

Charles Wiberley, aged 49, Smith—a Robust Man; Patient of Dr. Storer; Fever and Bronchitis.



1. Right lung; 1'. Left lung.—2. Pericardial sac.—3–3. Ventricles.—4. Right auricle.—5. Vena cava.—6. Aorta.—7. Pulmonary artery.—8. Liver.—9¹. Cardiac portion of the stomach; 9². Pyloric portion of the stomach.—10. Spleen.—11. Pancreas.—12–12. Kidneys. (See pp. 427–430.)

The capillaries of the smaller bronchial tubes were smaller than, but they presented the same general character with, those of the large tubes.

Many of the vessels supplying the air-cells were tortuous and irregular in size, resembling, in a modified form, those just described. Their distribution was exceedingly fine, and partook in some parts, especially near the bronchial tubes, of the tortuous irregularity of the supplying vessels. The vessels on the air-cells were usually, however, of normal form and distribution.

In Emphysematous Bronchitis.—In a specimen of bronchitis with emphysema, from the subject of diagram 20, the inner lining of the bronchial tubes presented a tortuous, very fine network of vessels; the calibre of each vessel was constantly varying, now bulging out, now narrowing to the finest capillary tube. The contiguous vessels, forming the exquisitely fine interlacements, differed remarkably from each other in size. The mucous membrane, though tumid from the excessive vascularity, was perfectly smooth. As the play of the minute vessels was from side to side, they were neither spirally twisted, nor raised in loops, nor in prominent interlacements, as in the former specimen.

The modified, turgid, increased vascularity of the bronchial mucous membrane undoubtedly extends into the intralobular cellular structure, especially in the neighbourhood of the moderate-sized bronchial tubes. In the subject of diagram 15, the openings of the minute, or lobular, into the larger bronchial tubes were narrowed, closed, and drawn into a slit-like form in the direction of the circular fibres. This

meeting of the walls was due to the tumid, vascular, and soft condition of the lining membrane. Is it not reasonable to infer, that the affection extends with more or less intensity into all the cells?

In the case of emphysema from which diagram 14 was taken, some of the bronchial tubes were thickened, opaque, and unvascular on their inner surface; other smaller tubes presented, on their inner surface, a diseased vascularity, closely resembling the same parts in the subject of diagram 15.

Imperfect Arterialization of the Blood.—The diseased secretions are found in the most minute, as well as in the largest, bronchial tubes.

The diseased vascular action, and the diseased mucus coating the vascular surface, interfere with the arterialization of the blood. The patient is necessitated to inspire deeply and frequently, and, in time, the whole volume of the lungs becomes permanently enlarged.

Form of the Chest.—The whole outlines of the chest, the diaphragm, and the relative seat of all the organs, present the characters of a constant deep inspiration, though not nearly to the same extent as in emphysema. Everything that has been said with regard to the position and form of parts in emphysema applies, though in a modified degree, to bronchitis. The former disease, emphysema, is only a necessary carrying out—an unavoidable development—of the latter disease, bronchitis.

Displacement of Organs.—In bronchitis the base of the lungs and the heart are much lowered; the impulse of the heart is generally in the epigastrium.

The liver and abdominal organs are thrust down in like manner, though not to a like extent, as in emphysema.

The extent to which the bronchitis has caused the lungs to dilate may, in the earlier stages, be invariably, and in the latter, generally, ascertained by comparing the seat of the depression, marking the site of the lower margin of the lung in the healthy state, with the present diseased site of that margin. A valuable measure of the extent and severity of the disease is thus supplied us.

Percussion.—The walls of the chest are everywhere unusually resonant; the resonance extends with the extension of the lung; and as the lungs are constantly dilated, the resonance on percussion is but little diminished during an expiration. The seat of the heart's dulness is lowered and narrowed.

Respiratory Sounds—in the Larynx.—The laryngeal sounds are loud and hissing. When the mucus reaches the vocal chords, the hissing sounds, especially during expiration, are modified or replaced by bubbling, soft flapping, or sonorous noises. Sometimes a cooing or sonorous noise accompanies the hissing noise during expiration; if these two sounds coexist, the cooing sound is generated in the bronchial tubes, and carried by the current of expired air, so as to be audible over the larynx.

In the larynx, trachea, and bronchial tubes, the sounds, both inspiratory and expiratory, vary with the constantly varying quantity and seat of the diseased mucus, which is ever being collected and expelled.

In the Bronchial Tubes.—In the bronchial tubes the noise is loud, grave, and sonorous, varying exceedingly in tone and loudness, from a mere loud hissing sound, through an unsonorous, repeated flapping sound, up to a loud, generally grave, reed tone. The hissing sound characterizes the narrowed tube, through which flow, uninterruptedly, compressed rapid currents of air: the silent-flapping noises are due to the slowly-repeated, gentle interruptions to these currents by a readily yielding tongue of mucus; and the sonorous, reed-toned noises, to the currents of air having to force their way, with frequent, rapid, regularly-recurring interruptions, through a clog of mucus occupying the tubes. The varying extent and consistence of this clog of mucus gives rise to the varying character of the notes.

The expiratory and inspiratory notes are perfectly alike in character, and nearly alike in loudness. The inspiratory sound is either alike loud during its whole duration, or is loudest toward the end of the expiration. The expiratory sound is always loudest at the first strike off, and becomes gradually feebler; the current of air, as it finds its way out, pushes aside and forward the clog of mucus.

The sonorous or reed-toned, and the clacking notes, given birth to in the bronchial tubes, are conveyed by the current of air, during expiration, to the larnyx; during inspiration, through the smaller bronchial tubes, to the surface of the chest.

If the accumulation be only in one lung, the inspiratory conveyed noise is heard with greater clearness and loudness over the whole walls of that side of the chest on which is the accumulation. If

the accumulation be in the trachea at the bifurcation, the sound is heard of like character over the whole of both sides of the chest. The expiratory tracheal, or bronchial sonorous noises, are also heard, though more feebly than the inspiratory, over the surface of the chest, especially in the neighbourhood of the large tubes; the sounds being conducted back to the surface by the walls of the tubes, as well as carried forward to the larynx by the current of air.

In the smaller Bronchial Tubes.—In the smaller bronchial tubes are excited an unlimited variety of notes; the notes vary with the ever-varying condition of the tubes. When the smaller bronchi are constricted by thickening of the lining membrane, by an universal glazing of secretion, or, possibly, by muscular contraction, respiration gives rise to a hissing noise about equally loud on expiration as on inspiration, unless the former act be slower than the latter.

When the secreted mucus accumulates in small quantities, and gives ready though gently interrupted passage to the currents of air, and when, I conceive, the opposed tumid walls of the small bronchial tubes meet each other at their outlet to the larger tubes, then repeated clackings, or gentle continued cooings, or really musical chirpings, are audible. There is, in truth, a musical *melange;* there are new tones, variations of the old notes, and perfect pauses. Their general character is that of a reed tone; the notes are produced, as in the clarionet, or hautboy, or in the larynx during speech, by the constant and very rapid meeting and

parting of the opposite walls, due to the alternate rush and interruption of the rapid current of air. The rapidity of the vibrations thus excited regulates the pitch of the note, which is sharper when they are more rapid, and graver when they are slower.

The rate of the current of air and the amount and consistence of the secretion regulate the rapidity of the vibration and the pitch of the tone; when the breathing is quickened the tones are sharper.

The inspiratory noise is usually of a like or only slightly modified character during its whole duration; but the expiratory always strikes off abruptly with its highest and loudest pitch; it gently lowers its note, and towards the middle or end of the act gives place to a hissing or silent flapping noise, or to a murmur. If the obstruction to the current of air be complete, there is no respiratory sound; but if it be removable, though with difficulty, the removal takes place towards the end of the inspiration, when a grave or sharp, usually loud, note suddenly strikes up; the expiration prolongs this note, of almost identical character, for a short time during the beginning of the act.

There is generally a resemblance in the tone between the expiratory and inspiratory sound. The expiratory cooing or sonorous noise is very often present when the inspiratory sound is merely murmuring or hissing.

Quickening of breathing often brings out for a time abnormal noises.—Very frequently, when no abnormal noise is excited by tranquil breathing, sudden, quick breathing gives birth to a cooing or other sonorous noise; this is much more frequently

heard during expiration than inspiration: if under these circumstances the quick breathing be continued, the reed, or flapping, or soft musical notes are gradually replaced by hissing or murmuring sounds. The sonorous noises generated in the smaller bronchial tubes are more frequently present, and are louder, over the sternal margins and thinner portions, than they are over the bulk, of the lungs. This is especially the case, where there is dilatation of the air-cells at those margins.

The vocal resonance and pectoral vibrations are unusually loud and extensive in bronchitis, varying with the extent of resonance on percussion and the amount of lung substance.

DISEASES OF THE LUNGS WHERE ONE ORGAN AND ONE SIDE OF THE CHEST ARE AMPLIFIED.

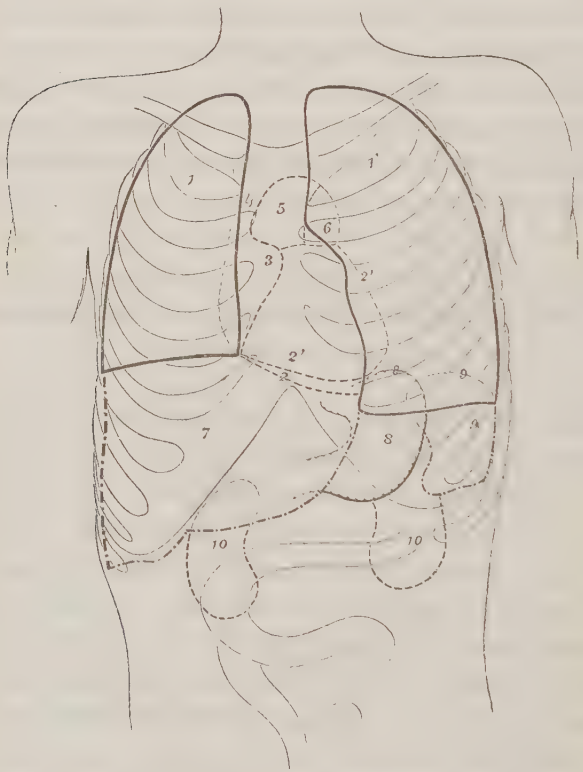
(DIAGRAMS 16, 17, AND L. 5.)

Pneumonia, Pleuritis, and diffused Tuberculous Consolidation.—In pneumonia and pleuritis, and in some cases of diffused consolidation of the lung from tuberculous deposit, the lung that is the seat of the disease becomes permanently enlarged. If but a small portion of the lung be affected, the enlargement from the disease is confined to the affected part. If the whole of one lobe or of one lung be involved, then is the enlargement proportionably diffused.

In diffused enlargement of the lung from any of these diseases, that organ, or the portion of it affected, puts on the same form that it acquires on a deep inspiration.

16.—TUBERCULOUS CONSOLIDATION AND ENLARGEMENT OF THE LEFT LUNG.

CHARLES GRIFFITTS, AGED 22, PATIENT OF MR. ATTENBURROW; SCROFULOUS DISEASE OF ANKLE; PHTHISIS.



1. Right lung; 1'. Left lung.—2. Pericardial sac; 2'. Ventricles.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Spleen. 9. Stomach.—10–10. Kidneys. (See p. 438.)

Artificial Distension of the Lungs.—Artificial distension of the lungs, when the walls of the pulmonic cavities are entire, distends those walls, exactly after the same form and to the same degree that they are expanded on the deepest possible inspiration; the amplified walls then dilate the lungs; the enlarged lungs now distend the walls.

The diseases above-named enlarge the lung or portion of lung affected to the extent and in the form that artificial distension, or that dilatation of the chest would enlarge it.

The costal walls of the chest and the diaphragm are pushed aside so as to assume exactly the same form as if those parts acted to expand the lung to a like degree. If the whole lung be distended, the effect on the walls and floor of the chest is exactly that of an excessive costo-diaphragmatic inspiration confined to one lung. If the lower lobe be affected, then the diaphragm below the affected lobe is pushed down, and the inferior costal walls are distended, the superior walls not being necessarily affected by it; if the upper lobe be affected, the superior portion only of the costal walls are expanded; if the disease be partial, the distension of the walls is partial likewise.

When any one of the diseases in question occurs, especially in an acutely inflamed stage, the muscles of inspiration act to expand the chest over the diseased part, and to withdraw from that part injurious pressure. The dilatation from inspiration so effected is almost or altogether permanent, to stave off from the inflamed parts the injury that perpetual friction would cause.

If the lower lobe be the seat of disease, the continuous deep inspiration is effected, by the fixed descent of the diaphragm, the abdominal muscles being rigid and motionless, and by the permanent dilatation of the inferior costal walls. The lower ribs of the affected side bulge outwards, and the inferior sixth, seventh, and eighth costal cartilages project forwards, upwards, and outwards, more than they do on the healthy side. At the same time the play of inspiration goes on in the upper part of the chest. If the upper lobe be affected there is permanent distension of the upper walls of the chest, and the diaphragm and inferior walls of the chest now act. We have here an eye-test of the portion of lung affected by acute disease; a visible invitation from the part affected to a further scrutiny.

Displacement of Abdominal Organs.—The abdominal organs are displaced, and replaced, by the diseased and enlarged lung, in the same manner and to the same extent that they are displaced and replaced by the inspiratory distension of the lung. As one side only of the chest is affected by excessive enlargement, the organs are pushed not directly, but obliquely downwards from the diseased towards the healthy side.

Displacement from enlargement of the left Lung.—If the left lung be enlarged, (diagram 16,) the inner margin of the lung advances to the right, so as to be behind the right upper part of the sternum. The apex of the heart is pushed downwards and to the left side. The lung advances in front of the apex and screens it, at the same time that it pushes it downwards to the right; the right ventricle is

pushed downwards towards the xyphoid cartilage and the right sixth, seventh, and eighth costal cartilages; the stomach, the spleen, and the left extremity of the liver, are also pushed downwards, and somewhat to the right, the whole mass of the liver being thrust more into the right side, exactly in the manner that the distended stomach acts in pushing the liver more completely to the right side.

Of the right Lung.—If the right lung be affected, (diagram L. 5,) the inner or sternal margin of the lung extends to the left of the centre of the sternum, the heart is pushed downwards and to the left, the liver is displaced downwards and a little to the left.

PNEUMONIA.

In pneumonia, the distension of the lung affected is complete, the inflamed part projects with a convex surface and defined edges, and stands out from the surrounding sound lung.

Microscopic changes observed in Pneumonia.—In a specimen of pneumonia that I examined, where several clusters of lobules, some of large, some of small size, were, in various parts of the lung, affected in different degrees, I saw, after minute inspection, the following appearances under the microscope.

The coats of the pulmonary artery were much thickened, and consisted of an inner and an outer layer of dense white fibrous, or tendinous structure. Intermediate to these layers was a highly vascular couch, consisting of a fine interlacement of capillary vessels of all sizes, some of which were straight, others tortuous or spiral; some were of equal calibre, while others were irregularly bulging, at one

point large and then suddenly small. The pulmonary artery was affected, to a greater or less degree everywhere, but the thickness of the vascular couch, and the irregularity in the vessels, were most marked just before the branches entered the inflamed portions of lung. After the vessel had penetrated the affected structure for a short distance, the injection of the capillaries of the middle couch suddenly ceased, those vessels being obliterated.

Half-organized fibrinous layers adhered to the inner coat of the pulmonary artery and were easily separated. At one point a small capillary vessel penetrated the inner coat of the artery, and entered the new soft membrane. These inner new membranes were general in the arteries, but were more and more strongly adherent near the inflamed structure; there their organization was undoubted; they became pulpy towards the centre and clogged up the vessel.

The capillaries on the inner membrane of the larger bronchial tubes entering the inflamed portion of lung, were much enlarged, irregularly swollen, and rather tortuous or spiral; they grouped into numerous elevations. The dark uninjected diseased air-cells on each side of the inflamed bronchial tube threw out the injected surface with great splendour. At length, the distended capillaries were suddenly enlarged, became globular, and abruptly came to an end. In other bronchial tubes the capillaries became gradually much smaller, their calibre diminishing more and more until they vanished; the injection failed in patches in these tubes, and at length gradually, or abruptly, ceased. The open-

ings of the smaller into these larger bronchial tubes were usually invisible, being obliterated by the distended capillaries rendering the walls tumid.

Where the pulmonary artery adjoined the bronchial tubes numerous small capillaries passed from the one to the other; where the injection stopped in the capillaries of the pulmonary arteries it stopped also in those of the adjoining bronchial tubes.

The capillaries of the inflamed portion of lung were void of injection. The filamentous and webbed walls of the air-cells were thick and opaque. There were small semi-opaque granules in the air-cells; these granules were of a dusky red in some parts, of a dark bluish hue in others. The colour of the granules determined the general tinge of that of the parts affected with pneumonia; some patches of pneumonic lung were reddish, others bluish; there was no perceptible difference between them except the colour of the granules.

The air-cells in the early stage, when washed, were quite entire. In some patches, where the disease was not so far advanced, irregularly enlarged capillaries, slightly tortuous, passed from the coats of the artery, for a short distance, into the midst of the cell; each large capillary formed a filament and subdivided into minute interlacements, which were also irregular in size, bulging, and twisted. Some of these minute interlacing capillaries were smaller than natural, and gradually vanished; others were large, swollen, and globular, and ended abruptly; there were never more than two or three interlacements before the capillaries came to an end. The injection could be seen in

some vessels to pass, in small grains, into the midst of a yielding structure—doubtless the diseased secretion that plugged up the capillaries, and effected the obstruction in the circulation of the air-cells. The same circumstance was observed in the abrupt endings of the capillaries on the bronchial tubes; some of them were closed by the thickening, gradual approach, and meeting of their inner walls.

The capillaries of the air-cells adjoining the inflamed portion were usually more highly injected than the capillaries of those further off. When the walls of the pulmonary arteries were much thickened by the vascular couch, and ran in the midst of vascular air-cells, the capillary vessels forming the filaments of those cells were irregularly large and slightly tortuous; and the interlacements on the webbed walls partook of the tortuously-irregular enlargement of the supplying capillaries; some of these capillaries were unusually small. This seemed to be the first stage of the disease; the capillaries were here ready to be blocked up by the disease. There were here and there, in the vascular air-cell tissue, little dark spots, consisting of a few cells whose vessels were obliterated.

Throughout the lung there were portions of its substance affected with pneumonia in all its stages.

First stage,—the air cell-walls are unusually minutely injected; the large, filamentous, and the small, webbed, interlacing capillaries, are irregularly large and tortuous.

Second,—the interlacing capillaries are either irregularly large and tortuous, and end abruptly after a bulge, being clogged by secretion; or else

they are unusually small, and gradually fine off to a point.

Third,—there are no capillaries whatever injected, or very few; the texture of the air-cells is thickened. The injected walls of the pulmonary artery, and of the large bronchial tubes, run for a short distance into the diseased structure, and then end abruptly.

Fourth,—there are no injected capillaries, and granules occupy the cells.

Fifth,—where there is hepatization, the pulmonary arteries are obliterated, forming white, tortuous-looking, ramifying chords. The pulmonary veins are collapsed. The cells are distended with hard, reddish brown, friable structure. The cells themselves have not now the smooth, defined character, under high microscopic powers, that they had; their walls are shaggy; the very fine filamentous texture, seen in the previous stage, becomes less definite, and is, as it were, apparently in strings of infinitely small beads or cells.

Sixth,—the stage of splenization, of breaking up of the cell structure, of complete softening and disorganization of the diffused granular structure, and of the gradual disappearance of the blocked up capillaries. The obliterated pulmonary arteries collapse, and remain in the form of tendinous filaments.

No stage of reparation was observable; indeed reparation cannot take place after completed pneumonia; the next best change, as Dr. Hodgkin states, is the constriction and conversion of the pneumonic tissue into solid white and tendinous structure.

I have observed pneumonia to end in universal tuberculous infiltration. This is by no means an unusual result.

Where the patches of pneumonia came to the surface, there was active pleuritis; the capillaries forming it being irregularly enlarged and tortuous, in the same manner with those in the bronchial tube entering the diseased lung. Over the highly vascular injected structure was a thin, firm, smooth, fibrous membrane, which was separable from it by the laceration of numerous small, white, glistening, pearly, tendinous filaments. In some places the injected capillaries were torn across; and at one or two spots the superficial membrame, instead of being thin, fibrous, and unvascular, was composed of red groups of tortuous, swollen, irregularly large capillaries. Over the advanced portion of the inflamed lung there was a dense, thick, tendinous, new membrane and thickened pleura, quite free from vessels. All round the boundaries of the diseased part the vessels shot in over it, being extended from a more remote pleuritis, where the vessels had not yet been obliterated.

The Capillary Branches of the Pulmonary Artery and Vein the primary seat of Pneumonia.—The capillary branches of the pulmonary artery and vein may be stated to be the essential primary seat of pneumonia. The coats of the artery are changed in structure and texture by a diseased modification in their cell-life; they are at first too soft and yielding. The heart's force, through the medium of the blood, thrusts aside and dilates the softened walls, stretches, and lengthens them. At a later

period, new material is formed within the vessels, which blocks up the affected capillaries. Parallel with this change is another going on in the capillaries of the same lung, but not in the same diseased part. The inner walls of the diseased capillaries thicken and approach each other, gradually lessening the calibre of the tubes, and at length meet, so as to close the capillaries; ultimately all the capillaries become obstructed, and, at an advanced stage, destroyed.

The air-cells, are essentially and in form subdivisions of the capillaries of the pulmonary artery and re-meetings in those of the pulmonary vein, each filamentous wall consists of a single vessel, and each related webbed wall consists of the interlaced capillary branches of that vessel.

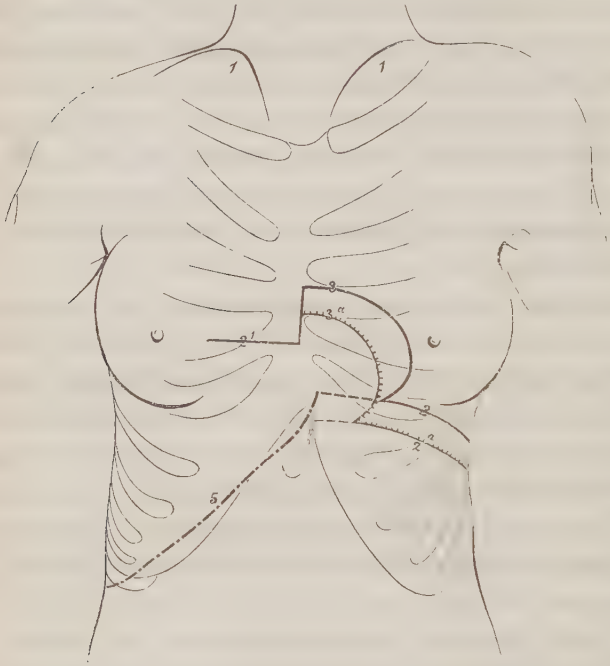
The bronchial tubes and the walls of the arteries themselves, are thickened and rendered fibrous by the new diseased vascularity.

The Inflamed Lung is solid and unmoved by respiration.—When pneumonia affects the whole lower lobe of a lung that lobe is rendered solid; the parts of it cannot move on each other; the lower part of the chest is permanently distended, being quite uninfluenced by the respiratory movements.

State of the healthy Lung.—The perfect rest that is forced on the diseased lung, and the usually increased energy of the arterial circulation, calls on the healthy portion of the diseased lung, and on the opposite healthy lung, to do more than double duty. The healthy lung substance is consequently more

L. 5.—PNEUMONIA OF MIDDLE AND LOWER LOBES OF RIGHT LUNG.

M. A. Moore, aged 27, Patient of Dr. Davidson.



Comparison with Health.—The affected lower and middle lobes of the right lung permanently amplified, to the extent of a very deep inspiration, pp. 435–37–38, and 445; Right lower ribs raised and fixed, p. 433; Conjoined sixth, seventh, and eighth costal cartilages raised; Right bulge of diaphragm lowered and motionless, p. 438.

1–1. Summits of lungs.—2'. Lower edge of upper lobe of right lung motionless on inspiration; 2. Lower edge of left lung; 2 *a*. Lower edge of left lung on deep inspiration.—3. Space of heart's superficial dulness, displaced a little to the left side by the inflamed lung, p. 439; 3 *a*. Space of heart's superficial dulness on deep inspiration.—5. Liver, usually more pushed downwards and to the left, p. 439.

December 14th, 1842.—Dulness on percussion over the lower and middle lobes of the right lung; over the lower lobe, inspiratory and expiratory friction sounds; œgophony, from co-existing vocal resonance and expiratory friction sound modulating each other: over middle lobe, crepitating rhonchus.—15th. Crepitating rhonchus and friction sounds exist together.—16th. Crepitations coarser.—17th. Improvement in general symptoms; crepitation everywhere; friction sound only over the scapula.

expanded than it is in health, though the expansion is trifling compared to that of the diseased portion of lung.

The depressions over the lower boundaries of the healthy lung and heart still remain, which enable us to compare the healthy with the present diseased seat of those boundaries.

The lower margin of the left lung is easily ascertained by relative percussion over the solid lung and hollow stomach.

If the consolidation be complete, and affect the whole base of the right lung, percussion does not give us any information as to the seat of the inferior margins of the lower lobe. The existence of characteristic sounds of pneumonia will often indicate this margin; but in the stage of complete consolidation I know of no means by which it may be ascertained. In diagram L. 5, there was crepitating rhonchus in front, and friction sound behind, (see the case,) so that in this subject it could be traced with some degree of accuracy; but I have not inserted any boundary line, as it must have been, more or less, guessed at.

The extent to which the heart and liver are displaced, the expansion of the walls of the chest, and the difference in the measurement of the diseased and the healthy sides, are the most serviceable assisting signs next to the sounds on auscultation.

An accurate knowledge of the boundaries of the lower and middle lobes is of great importance in examining persons, the subjects of pneumonia. The seat of those boundaries, and the changes effected in that seat by a deep inspiration, and in

pneumonia, are shown in diagram 11, and in L. 5, in which the upper boundary of the consolidated middle lobe is indicated by the lower margin of the resonant portion of the right lung.

Percussion.—Percussion, unaided by the stethoscopic signs, will usually inform us of the existence of pneumonia. The dulness is complete; and as the disease is usually confined to one lung, the contrast, especially on a deep inspiration, is pronounced.

Respiratory Sounds and Vocal Resonance.—The modification in the breathing and in the vocal resonance effected by this disease, will differ in different stages.

In the first stage of increased vascularity, inspiratory and expiratory sounds will be heard, more of a hissing than a murmuring character.

In the second and third stages of almost and entirely clogged capillaries, without effusion of soft material into the cells, but where they are doubtless filled by a thin fluid secretion, the minute, very fine crepitation is heard at the end of the inspiration. The air that first takes its course into the more open air-tubes and cells, forces itself, in the state of extreme chest distension, through the thin secretion in the diseased tubes and air-cells into the cells superficial to them beyond, which are expanded by the inspiratory action.

In the fourth stage, where the cells are filled with a diseased pulpy excretion, no air can enter them, and no crepitation is produced; but the still open bronchial tubes convey the respiratory sounds excited in the larynx, and also take up

and convey to the surface the vocal vibrations. As the bronchial tubes are better, more concentrated conductors than the areolar lung tissue, the respiration is bronchial or is accompanied with abnormal sounds, and the vocal resonance is, perhaps, louder than in the healthy state; at all events it is modified, and a modified sound catches hold of the ear and gives it the impression of being louder, because it is more remarkable.

In the stage of perfect hepatization the bronchi are no longer open tubes; the respiratory sounds and the vocal resonance are no longer conducted by them to the surface; there is a dead silence over the whole solidified lung structure, unless motion be permitted, when friction sounds may be excited if pleuritis exist.

In the stage of breaking up, if the broken-up structure communicates with the bronchial tubes, and discharges itself through them, then various mucous noises are made. If the corruption to be discharged is in a cavity capable of inspiratory distension, gurgling noises are present; if an empty cavity is formed, there is cavernous respiration, and the modification of vocal resonance, produced by the accompanying hissing, cavernous expiration.

Termination in Consolidation.—If pneumonia ends in perfect consolidation there will be neither sound nor vocal resonance, merely dulness on percussion.

The above is merely an attempt, on deficient evidence, to connect the pathological changes with the changes in the respiratory sounds and vocal resonance.

PLEURITIS.

Pleuritis, like pneumonia, leads to an inspiratory enlargement of the chest; but as the surface only, not the substance of the lung, is affected, the lung is not intersticially enlarged to any extent by the disease. The enlargement in the early stages of pleuritis is not nearly so great as in pneumonia.

Respiratory Movements.—In pleuritis the walls of the chest are drawn away from the inflamed lung surface; of course that surface follows; but the pressure exerted by the walls of the chest is diminished. The breathing movements are not, as in pneumonia, arrested, though they are much diminished; the respiration still goes on, though with less respiratory variation in the diseased lung, that lung being constantly amplified by the dilating action of expanded walls. If there were no motion of the walls of the chest on the inflamed surface, there would be less irritation; but if, as is generally the case, the pleuritis should go on to form adhesions, then those adhesions would be short, and would bind the lung close to, and altogether prevent its play upon the costal walls. As it is, the adhesions are stretched when in the soft forming state by the breathing movements; and when they are established, with a sound lung beneath, they form long tendinous fibres, which connect the lung to, and allow it considerable play upon, the walls of the chest.

Simple Pleuritis.—Simple pleuritis is a very frequent, often an unfelt, disease; but pleuritis is more

frequent still, as an accompaniment to other diseases. Most of the diseases of the lungs give birth to pleuritis; and the secondary generated form of pleuritis partakes of the characteristic nature of the primary exciting disease. The varieties of pleuritis are as numerous as the diseases that excite it.

Simple pleuritis is very often occasioned by exposure of the skin, when in a perspirable or susceptible state, to cold; it is also caused by extensive injuries to the skin, as in burns, or to other parts. In a patient that died 27 hours after being burned all over, there were minute violet spots, like spots of violet ink, scattered over the surface of the base of the lung and fringing its margin. After minute injection, the lung being previously soaked in water to allow the blood in the vessels to exude and transude, the violet spots were found to consist of slightly projecting groups of crowded, exceedingly minute, twisted, and curved capillaries, interlacing in every direction, and originating in an enlarged curved, sub-pleural capillary, which was observed to project through the pleura.

Microscopic characters.—In other cases of simple pleuritis I have noticed the following appearances under the microscope:—

In the earlier stages, and in the more limited forms of disease—a capillary vessel coursing under the pleura, much and irregularly enlarged and lengthened, consequently running in meandering and spiral curves. The pleura over the capillary was thin and perfectly transparent; the healthy contiguous capillaries were very small, and just seen through

the opaque, almost aponeuretic, pleura. In other places, several small vessels communicated with the larger vessel under the pleura; in others, as in the case of death from burning just described, the enlarged old capillary gave birth to myriads of new capillaries, twisted and curved like itself.

The pleura was not penetrated nor much raised; it was very thin, and bulged up in points by the enlarged capillaries underneath.

In other and rather more developed stages, the enlarged vessel raises the pleura so far as to force itself quite above the level of its surface; in some points a single fine new capillary steps out from below the pleura, though covered by its softened texture, in which, and in the softened structure of the capillary walls, it takes its course, gives one curve, makes a single loop, returns through the pleura to its former level, and re-merges in an old capillary. In others there are several interlacing loops forming a single violet point in the recent lung. In others, the new capillaries form very numerous interlacements, occupy a wider and more raised area, fill a raised web of new vascular structure, running in a soft transparent membrane; they gradually coalesce, still interlacing, and re-merge in one or more enlarged old capillaries, which sink below the surface of the pleura and join the healthy vessels. In others, the groups are much more extensive and more raised, forming in the recent subject what are styled shreds of lymph or layers of false membrane.

Vascular Filaments.—In other parts, a bundle of new capillaries, not tortuous, but running straight,

parallel with each other, interlacing at right angles, rises quite away from the pleura, and forms a free, highly injected filament, which lies loose upon the surface of the pleura for a space varying from a line to one or two inches in length; the distant end adheres to another portion of the pleura; there the new capillaries pass again below its surface to join the healthy vessels. These raised vascular filaments are most frequently observed where the edges of two lobes come together; the new bundle of capillaries from one lobe meets a like band from the adjoining lobe; they coalesce and form a vascular thread linking the two lobes. Where the opposed surfaces of the two lobes meet they are united by an universal interchange of new capillaries, circulating from the old capillaries of one lobe to the old capillaries of the other. Each lobe at first throws out the new capillaries above the surface independently; the soft plastic structures in which the capillaries wander project from each side, meet, and coalesce, and the capillaries from the two sides mingle blood, forming one set of new interchanging vessels, instead of two advancing new sets. The movements of respiration cause the opposed lobes to slide on each other; after the opposite new capillary bundles meet and form soft vascular threads, the respiratory movements stretch and lengthen those threads.

Pleuritic adhesions.—When the costal pleura is inflamed and the new soft structure from the pulmonic meets with that from the costal pleura, they join, their capillaries interlace, they make one plastic web, which is perpetually and at all points

being strectched by the respiratory gliding movements; this originally equal couch becomes stretched into long filamentous bundles of new straight capillaries that lie side by side. When two small patches coalesce, the structure is stretched into distinct, loose, floating vascular threads; sometimes these threads stretch the full length and remain entire, forming connecting threads between the opposed surfaces. Generally the vascular uniting threads are stretched until their structure becomes so fine that it gives way, and then, as the adjoining filaments have interlaced and been linked together in loops here and there, there lies upon the surface of the pleura a number of highly vascular and new filaments, looping variously with one another, often in remarkable interlacing branches. Nothing is more beautiful than these new trees of vessels, that have risen from two opposed roots, linked, been stretched, subdivided, attenuated, and at length separated by the force that has produced (stretched) them; these two opposite systems of ramifying vascular filaments, replacing the vascular couches that at first glued together the opposed surfaces.*

The lower margins of the lung, and the meeting edges of the lobes, are the parts of the lung most liable to the formation of pleuritic capillaries; there are these coalitions most frequent: over these points simple pleuritis first shows itself, and there are the indicating friction sounds most frequently heard. If the extent of the opposed pleuritic surfaces be great,

* I have never injected the vessels supplying the costal pleura; what I have said with regard to costal pleuritis is an inference—I think a legitimate inference—from what I have seen with regard to pulmonary pleuritis.

the soft new structures stretch one another, and in parting form a surface, shaggy from piles of raised soft villous-looking prominences; these are of the same character on the costal and on the contiguous pulmonic pleura.

When the pleuritis is very extensive, arising from universal outward irritation, or the eccentric spreading of inward special inflammation, the whole surface is covered with a vascular couch, the injected capillaries of which are usually irregularly large, tortuous, and interlacing. The surface is usually raised in short elongated ridges, like the waves in the sea sand, owing apparently to the rippling up of the surface caused by the motions of respiration; the ripple runs across the direction of the respiratory motion. If the costal pleura be in like manner affected, the opposing ripples rub upon each. In these circumstances loud, smooth, to-and-fro respiratory friction sounds are heard.

In all those cases of pleuritis where the structure, bearing new capillaries, rises above the surface of the pleura, that structure may be torn away in webs from the cellular surface beneath. In doing so the enlarged capillaries springing from healthy capillaries are torn across, and numerous open mouths are left on the inflamed surface. This exposed surface is not properly the old serous covering of the pleura, but is the fibrous or aponeurotic structure, over which the serous covering was spread.

The old serous surface is lifted up on the top of the new vascular structure, and partakes of its softening; the so-called lymph is, then, a new vascular structure; that is, an extension, development,

undefined prolongation, and branching of the old vascular structure. It is covered and kept in such form as it has, by the old serous investment, though that investment is involved in, and alike in quality with, the new structure. Where opposite surfaces of new vascularity meet and coalesce, there each serous membrane is fused in the structure, and is immediately pierced by the capillaries that before turned back and looped when they approached it.

The aponeurotic pleura beneath the new capillary couch often partakes of the diseased capillary condition; the tendinous fibres are forced up and aside, and the whole structure is thickened by the newly-developed, tortuous capillaries.

Stage of Condensation.—After the new tissue is fully developed by the prolonged, infinitely ramifying, interlacing capillaries, the softness and transparency of that tissue gives place to a gradually increasing closeness, firmness, and opacity. The structure gradually contracts, and new tissue is formed in the inner walls of the capillaries; these walls gradually approach and narrow the tubes, they fine off, and at length the opposing walls meet and obliterate the capillaries. The tissue now becomes dense, white, and tendinous; in many parts quite void of vessels; in others, vessels run the length of the fibres; the interlacing vessels are obliterated. I have noticed in some specimens, where the transparent vascular was changing to the hard tendinous structure, that the injection suddenly stopped, and a few grains of injected material forced its way into the effused secretion, filling and blocking up the vessel. I am disposed to think that this filling up

coincides with the further narrowing process in most cases of consolidation of tissue; but observations are required to settle this point.

The formed adhesions have the same prolonged tendinous character that I have just described; the filaments drawn out in the vascular state become condensed tendinous fibres.

Formation of thick tendinous, cartilaginous, and bony patches.—Sometimes, while the new superficial couch, on which are spots of vascularity, is hardened, solid, and tendinous, new capillary growth goes on underneath; the solid new structure can be easily torn from the deeper active vascularity. The structure of the new deeper vessels, as they have finished their development, contracts, the vessels are filled up and obliterated, and form new tendinous fibres that combine with and thicken the superficial tendinous couch. The whole mass goes on thickening sometimes to an enormous extent; its surface becomes hard, cartilaginous, and at length bony; and I doubt not the change of cell-structure peculiar to the formation of healthy cartilage and bone is followed up here.

The Pleura tendinous; the development of its new vascularity also tendinous.—The vessels of pleuritis spring from a tendinous tissue, and their final development is tendinous; the same obtained in the vascular development in the walls of the pulmonary artery in pneumonia. There was no difference between the white tendinous structure that replaced the vascular tissue in or upon the pleura in one case, and in or upon the coats of the artery in the other.

Brown, shaggy, uninjectable Membrane.—There is frequently a soft, sometimes hard, darkish brown, uninjected covering, over a well-established, highly vascular, new tissue. I have not had an opportunity of seeing the manner in which this is formed; perhaps it is the deposit from the pleuritic effusion; it is usually rough, villous, or shaggy, and the costal and pulmonic pleura have corresponding rough surfaces where they meet; but I think these membranes of new texture have been formed in the same manner with the tendinous membranes and patches on the pleura.

Origin of Pleuritis from other diseases.—Pleuritis often arises from the extension of inflammation existing in the fibro-serous membrane of an adjoining cavity, such as that of the pericardium, of the opposite pleura, and of the peritoneum. The fibrous or muscular structure between the inflamed and sound serous covering, takes on the inflamed action and gives it over to the healthy serous covering; this produces irritating secretion and excites inflammation in the opposed pleura covering the contiguous lung. The pleuritis thus arising does not differ in character from simple pleuritis.

Complication with Bronchitis, Emphysema, Pneumonia and Phthisis.—Inflammation of the pleura often results from the extension of some deeper lung disease. The character of the pleuritis so produced closely resembles, and is usually, in general principles, identical with that of the primary exciting affection.

Bronchitis is often accompanied by pleuritis, that differs in no marked circumstance from the simple affection.

In *emphysema* pleuritis is very frequent. The new capillaries spring generally from straight or slightly curved equally enlarged old capillaries, and interlace with each other at right angles, or in slight curves; they are very small, and nearly of equal calibre; they do not form elevated groups, but are usually almost flat; they become obliterated by the walls of the tubes gradually approaching and meeting. These characters agree with those of the capillary changes of emphysema. The new dense membrane formed is usually not very thick.

In *pneumonia*, as we have seen, the vessels on the pleuritic surface were like those on the affected bronchial tube, tortuous, not raised. Where the inflamed structure of the lung had advanced to the stage of hepatization, the pleuritis had advanced to the formation of tendinous membrane, free from vessels.

We shall observe that in *phthisis* the coexisting pleuritis has the same general character as the disease exciting it.

Distribution of the Capillaries.—The degree of softening or alteration in the tissue forming the capillaries rules the degree of distension, twisting, looping, and irregularity in the distribution of the capillaries in that tissue. All the minute myriads of new prolonged capillaries have exactly the same form of walls and line of direction that the parent capillary has. If the parent capillary be straight and have walls of equal diameter, the new capillaries run in a straight direction, and ramify and interlace at right angles, and the group formed by them is not much elevated. If the parent vessel be equal in diameter and proceed in a curve, the new minute

capillaries course and interlace in curves also. If the parent vessel be irregularly large, now small, now bulging, tortuous, meandering, spiral, and rising in loops, the new minute capillaries have exactly the same form and direction; their interlaced groups consist each of a raised irregularly bulging network of tortuous, spiral capillaries. The current and course, then, of the parent capillary gives the law to the current and course of the new capillaries.*

Enlargement of the Affected Side.—The affected side is not so much larger than the sound side in pleuritis as in pneumonia; the edges of the lung do not descend so low.

* I quote the following from Dr. Hodgkin's "Lectures on the Morbid Anatomy of the Serous Membranes:"—

"When the false membranes have been organized for a short time, they are reddened by the innumerable minute vessels which they contain;"—"The existence of vessels in false membranes was first pointed out by Stolle. Dr. Baillie injected them; and Dupuytren appears to have done the same, without the knowledge of what Baillie had done. Villermé says, that in the third stage they may be injected with mercury, but not with other materials. I believe, on the contrary, that they will admit of fine size injection, at a very early period," p. 49.

"Though I see no room, therefore, to doubt for a moment the source whence the new vessels are derived, we are still much in the dark as to the mode in which the formation takes place."—"My own opinion is, that, at the inflamed part, the minute blood-vessels not merely become distended, but that their delicate parietes, and the structure through which they ramify, become softened, and, yielding to the pressure of the blood in the distended vessels, give way at numerous minute points."—"These spots, which are at first irregular, afterwards have a dendritic appearance; and extending in length, they become vessels. These vessels being feebly supported, are distended and larger than those in the original structure from which they proceed; hence the redness of newly-organized false membranes. At a subsequent period, these vessels contract, and may become nearly or quite invisible," p. 50. See at p. 55, the contraction and obliteration of the new vessels described as giving place to induration.

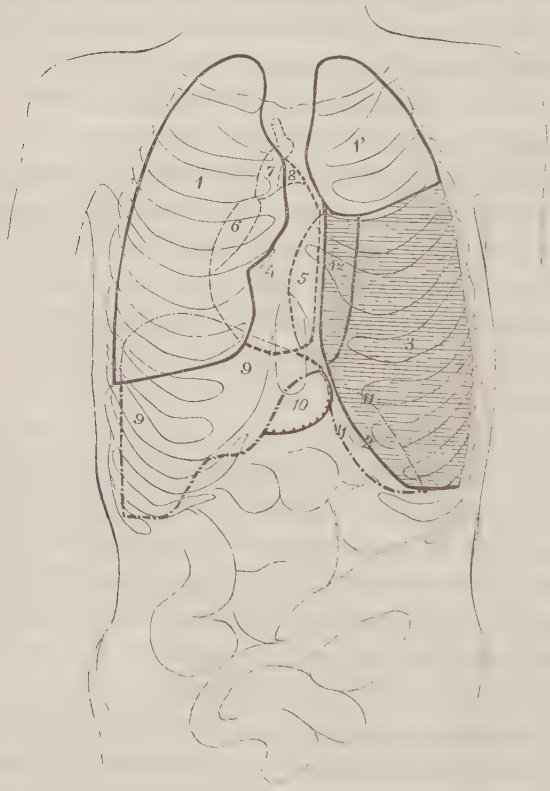
Effusion of fluid into the cavity of the Pleura.—In pleuritis an excess of serous fluid quickly accumulates in the cavity. In such cases (diagrams 17 and L. 6) the walls of the chest are pushed out in strict proportion to the quantity of fluid collected; the lung is compressed backwards, and to the centre against its bronchial attachment. The heart is pushed over to the opposite side. If the collection be on the left side the impulse is felt in the epigastrium, the apex (diagram 17) pointing there. If the right side be distended, the apex presents between the sixth and seventh, or seventh and eighth left ribs. The distended cavity encroaches on the sound cavity behind the sternum, as in diagram L. 6.

The abdominal organs are displaced downwards and towards the healthy side. If the left side be affected, (diagram 17.) the stomach and spleen are pushed downwards and to the right, occupying the centre of the abdomen ; if the right side be affected, (diagram L. 6,) the liver is pushed downwards and to the left, quite below the costal cartilage, behind the muscular walls of the abdomen.

Distension from Pleuritic effusion contrasted with that from Pneumonia.—In distension of the chest from pleuritic effusion the intercostal spaces are on a level with the ribs. In pneumonia, the distension of the chest and the displacement of the viscera are identical with the distension and displacement from a deep inspiration. In pleuritic effusion of fluid or air the distension is in every direction; the bulging does not take on the form of the lungs, but it presents a general, somewhat globular distension.

17.—PLEURITIC EFFUSION ON LEFT SIDE.

JAMES ALEXANDER, AGED 36, A DISSOLUTE ACTOR; PATIENT OF DR. WILLIAMS. PHTHISIS AND PLEURITIC EFFUSION.



1. Right lung; 1'. Left lung, upper lobe.—1_2. Left lung, lower lobe condensed by the effusion.—2. Pleura and diaphragm pushed down by pleuritic effusion.—3. Pleuritic effusion.—4. Right ventricle.—5. Left ventricle.—6. Right auricle. 7. Aorta.—8. Pulmonary artery.—9. Liver.—10. Stomach.—11. Spleen.

Weight of Organs.—Right lung, 26 ounces; left lung, 28 ditto; heart, 10 ditto; liver, 61 ditto; spleen, $4\frac{1}{2}$ ditto; pancreas, 4 ditto; both kidneys, 12 ditto.

Upper lobe of left lung adherent; consolidated by tubercles; contained vomicæ; effusion (more than a quart) in the left pleuritic cavity, condensing the lower lobe of the left lung, pushing the heart to the right side, and the diaphragm downwards, thus displaeing downwards to the right the stomach and spleen; right lung large; a few tubercles; two ounces of fluid in the pericardium, p. 461.

The superior ribs are separated from each other; in pneumonia they approach. In pleuritic effusion the mediastinum and heart are thrust over to the opposite side; in pneumonia the displacement of the mediastinum and heart is comparatively slight. In pleuritic effusion of the right side the lower edge of the liver is pushed down considerably below the eleventh rib; the whole liver in extreme cases is thrust down from behind the cartilages of the ribs. In pneumonia the lower portions of the liver alone protrude beyond the cartilages, the bulk of the organ being still behind them.

The displacements from effusion of air into the pleural cavity are the same with those from effusion of fluid.

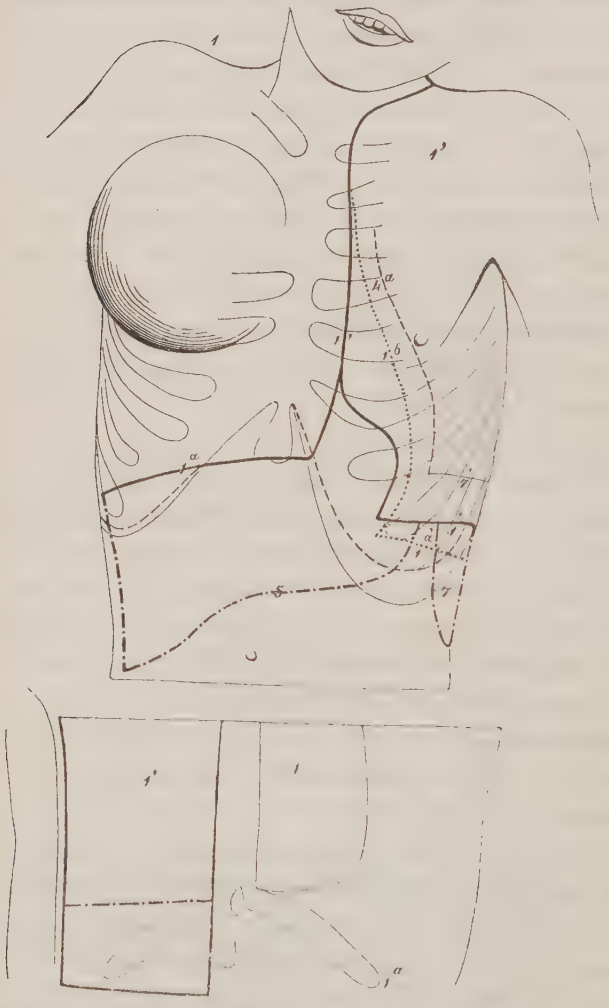
Percussion.—Percussion over the pleuritic lung is usually quite as resonant as it is over the healthy lung; I have observed it to be even more resonant. The surface of the lung is less resonant, from slight condensation in the texture, than it is in health. The increase in the volume of the lung, owing to the universal expansion of the affected side of the chest, compensates for the dulness that the comparatively slight consolidation over the lung would occasion.

When the lung is compressed by effused fluid the resonance is diminished. The lung gives birth to a dull sound on percussion compared with the resonance over the healthy lung, but a resonant sound compared with the dulness over the effusion.

Respiratory Sounds.—The surface of the lung loses its smoothness in the early stage of pleuritis. The enlarged capillaries raise and roughen the sur-

L. 6.—PLEURITIC EFFUSION ON RIGHT SIDE.

JOHN ROCKLEY, AGED 18, PATIENT OF MR. ATTENBURROW; TUMOUR OCCUPYING THE RIGHT SIDE OF THE CHEST.



Comparison with Health.—The side on which is the effusion unusually distended; the upper ribs and their cartilages separated; the ribs immoveable; the lower costal cartilages raised, p. 461.

1. Dorsal or lower view; the condensed right lung, over which friction sounds

face of the pleura. A faint friction sound is excited in this stage, louder on inspiration than expiration.

When the new vascular membranes form elevations on the surfaces of the opposed pleuræ, the friction sounds become loud; the noise usually resembles the blowing of the blast bellows, or the sound excited by whispering into the ear, or by loud laryngeal respiration. The expiratory sound differs little, either in loudness, intensity, or quality, from the inspiratory sound; it gives the impression of the current of sound taking the opposite direction. These sounds quite mask the respiratory sounds. When the patient whispers the expiratory sound is heard; the whisper appears to proceed from exactly below the ear; when he speaks, pectoral resonance and vocal vibrations are excited in the walls of the chest. The pectoral resonance on the sound and the diseased sides does not differ materially; if anything, the resonance is loudest over the pleuritic lung, when there is no effusion; as that lung is the largest, the volume of the vibrating mass of lung is increased.

Pectoral Resonance; Œgophony.—The pectoral resonance is accompanied by the whispering friction-sound; the two sounds are heard together, just as the drone and the notes of the bagpipe are; the person seems to be whispering and speaking into the ear at the same time; a peculiar tremulous or

and œgophony were heard.—1*a*. The lower boundaries of the effusion.—1'. The left lung much encroached upon and compressed by the effusion; to make up for the lateral compression it is developed downwards.—1*b*. The bounds of the left lung some days later when the effusion was increased; the heart is displaced downwards and to the left.—4*a*. Deep bounds of the heart.—5. Liver displaced downwards and to the left.—7. Spleen.

bleating vibration is produced, in fact, œgophony. Towards the end of each word the vocal vibrations die away, and then the smooth whispering sound is easily distinguished; it is at first almost drowned by the more noisy vocal vibration; but it continues when that noise has lulled or ceased, and it is towards the end of each word quite palpable.

Where fluid is effused the vocal vibrations and the friction sounds are not produced. As effused fluid pushes the lung upwards, backwards, and inwards, the condensed lung lies just in front of the posterior angles of the ribs, and there it is resonant on percussion, in comparison with the dull sound elicited over the effusion; though it conveys a dull sound, owing to the condensation of the lungs' tissue, when compared with the resonance over the healthy lung.

The vocal vibrations and pectoral resonance are feebler over the condensed than they are over the healthy lung; but they still exist. The friction sound is still heard over the condensed lung, and the lower margin of this lung can be traced by this sign; the contrast between the comparative silence over the effusion and the loud friction sound over the lung being marked. The whispering expiratory friction sound is heard along with the pectoral vibrations; as the latter are not overwhelmingly loud, the former is distinct and modulates markedly the stamp of the resonance, which has a more bleating character in this stage than it has when there is no effusion.

I have never heard any sound over the seat of effusion excepting the transmitted unmodified friction sound. I cannot see how a thin layer of fluid

can give rise to a bleating noise; the friction sound must cease if there be a thin layer of fluid; and in every bleating noise that I have heard there was the modulating combination of vocal, pectoral resonance, and whispering friction sound. But I do not believe that a very thin layer of fluid ever has place between the lung and the walls of the chest over the dorsum, unless some peculiarity of adhesions binds the lung in one place. The whole bulk of the lung is compressed, and that steadily backwards, inwards, and upwards; the thinnest layer of fluid must be at a little distance from the spine. Where the convexity of the lung and concavity of the chest leave each other there must be a wedge-shaped portion of fluid; but the bleating sound is nearer the spine than this point.

After the vascular stage gives birth and place to the tendinous, the roughened surface will still cause a friction sound, though not with the loudness and intensity of the vascular friction sound. As the tendinous coat becomes perfectly dense, its surface becomes nearly smooth, it is only slightly, microscopically rippled, and the friction sounds are no longer created.

Faint Friction Sounds.—Besides the loud, coarse, and very audible friction sound just described, there are several less noisy, less marked degrees or varieties. There is often a coarseness of respiratory noises produced by pleuritis, louder on inspiration than expiration, but audible with both. The pectoral resonance drowns it, but with a whisper it is perfectly audible.

These fainter friction sounds are usually heard

over the lower margins of the lung or the divisions of the lobes; they can be readily distinguished at the base of the lung, as, although only a little louder or more hissing, less murmuring than the respiratory murmur at the upper part of the lung, they are noisy, compared with the very feeble inspiratory sound, and with the freedom from expiratory sound over the lower part of the chest.

Modification by complication of Pleuritis with other diseases.—As nearly all the diseases of the lungs are or may be attended by pleuritis, and as the character of the new vascular formation differs in each disorder, a slight modification of friction sound must exist in and characterise each disease.

In emphysema I have never satisfactorily heard friction sound; it is disputable whether the hissing noise over the greatly dilated marginal cells be due to friction sound or to the entrance of air through narrow openings into large sacs. I conceive the latter to be the usual cause; but as pleuritis does exist in many cases of emphysema, and leaves its traces in thickening, and is present actively in small patches, there must, in such cases, be a friction sound excited; as the pleura is scarcely roughened, the friction sound must be slight.

Pneumonia (diagram L. 5) is usually attended by pleuritis, and at an early stage the friction sound of pleuritis may doubtless be heard; but the pneumonic lung is generally quite at rest, unmoved by respiratory actions; and as there is no friction between the surfaces, there can be, of course, no friction sound. As the new vascularity of pneumonic pleuritis does not cause much roughness of surface, any respiratory rubbing of the opposed

surfaces of pleura that may exist cannot excite a very loud friction sound.

It certainly requires explanation why crepitating noises are so seldom accompanied by friction sound. May it not be that at an early stage the friction sound frequently does exist, and is either not subjected to examination or that the so-called "puerile respiration" may be the modulated friction sound of very early pneumonia.

Phthisis never goes through its stages without attendant pleuritis, going the length of adhesions. Very often the lung that is in the least advanced stage gives evidence of pleuritis, by a modified friction sound over the upper part of the chest. This is often styled "puerile respiration," and it closely resembles it.

Over the body of the lung, when tuberculous consolidation takes place, friction sounds are very palpable; but they do not usually produce the loud whispering friction sound, but a gentle hissing noise, fainter on expiration than on inspiration, but audible when the patient whispers.

When adhesions take place all friction sounds cease over and in the neighbourhood of the adhesions. If we find in the progress of a case sudden disappearance of friction sounds, we are pretty well assured that adhesions have just taken place.

DISEASES IN WHICH THE BULK OF THE AFFECTED LUNG IS LESSENED.

PHTHISIS. (DIAGRAMS 16, 18, AND L. 6.)

Where phthisis is so far advanced as to be recognised, the affected part of the lung is lessened; where both lungs are diseased, that portion is the

smallest that is in the most advanced stage of the disease.

Besides the lessening, either from contraction or want of inspiratory enlargement, the whole volume of the lungs is usually diminished. The rule that the bulk of the portion of lung affected with phthisis is lessened, is not invariable.

Respiratory play of the Lung lessened.—The play of the affected portion of the lung is diminished; the diseased portion of the lung does not expand so much during inspiration as the healthy portion. The more advanced the stage of the disease the less moveable is the diseased portion, up to the stage of destruction and evacuation of the morbid structure and the formation of a cavity, when this cavity, not the diseased structure, has a play of expansion and contraction during the like play of the chest in breathing.

Tubercles seated in all textures.—Tuberculous structure, whether in a miliary, granular, or diffused form, is seated in every component texture of the lung, whatever part of the lung be diseased.

Tubercles are formed in the coats of the pulmonary artery, in the walls of the bronchial tubes; they infest the air-cells, and are seated in, upon, and under the pleura; the disease is the same, wherever the seat. If the tubercles be miliary or granular in the air-cells, they are respectively miliary or granular on the serous and mucous surfaces, and in the coats of the pulmonary artery.

Minute Granules.—There are scattered all over and in every texture of the affected part of the lung, numerous small, bright, minute spots; they give an effect as if the lung had fallen upon some very

white, bright particled sand; so universally are they scattered in some specimens that the lung seems sprinkled with diamond dust.

These microscopic granules are seated in the capillary structure of the air-cells; on the mucous surface, and in the walls of the bronchial tubes; on the inner lining of the pulmonary artery, and in the thickened structure of its walls; on the surface of the pleura and in its fibrous coat, whether it be but little changed, or be thickened by the formation of new constructing vascular, or aponeurotic constructed membranes: everywhere, and in all stages, do these little bright sparkling spots occupy the structure of the lung; they are likewise observable on the surface of the tubercles.

These bright points differ very much in size in different specimens; they were most minute in a specimen of lung infested everywhere with miliary tubercles; they were largest in an instance where the tubercles were coarse, granular, and soft in structure.

Description of the Granules.—Each minute granule was found to consist of a cell with diaphanous walls, varying in size, even in the same specimen, ranging from the 1000th to the 100th part of an inch. No nucleus was discerned in the cell, but scattered all over its surface were many very minute cells; some, almost point-like under the $\frac{1}{8}$th of an inch focus; others, above $\frac{1}{4000}$ of an inch in size. On the surface of the larger secondary cells other cells were observable. The parent cells were usually round, with slight elevations and depressions on the surface; one of them was slightly

indented where one of the larger secondary cells was seated; some were oval, or bulging at one extremity. In one lung the cells were particularly large and transparent, like little bladders; on the pleuritic new white membrane they gave the impression of being depressions; the reflected glare and the transmission of light showed their real nature. It was not observed that secondary cells were seated on their surface; many of them were remarkably elongated.

There were other small particles observed, of about the same size as the cells, but not so bright; they were dull and semi-opaque; they were chiefly noticed on the pleura, but several of them were deposited on the walls of the air-cells. These particles consisted of myriads of very minute transparent spikes, that radiated from a common semi-opaque centre; many of these spikes were tipped by minute cells.

Pulmonary Artery.—The coats of the pulmonary artery were everywhere more or less thickened by an extension of its fibrous outer tissue; numerous little tendinous, pearly, glistening, disjointed fibres, or pearl-like spots, formed this thickening. In many points new capillaries, some tortuous, some straight, coursed in the thickened outer couch; the vessels were most numerous where the structure of the couch was loosest. The thickening was irregular, and in many points bulged out into tubercles, that partook of the structure of the thickened wall of the artery. The tubercles so seated differed in density of structure; some were loose, semi-opaque, dotted over with pearly spots, and in many of these

minute, tortuous, or straight capillaries were seated, which were most numerous and most tortuous at the surface, but were denied to no part; others were quite opaque, without vessels, close-structured, alike throughout, and usually more or less spherical. On their surface straggled capillaries of varying size, some straight, some tortuous, and a few irregularly large. The injection came to an end in apparently a vain attempt to penetrate the surface; many of them fined off in a pencil-like point; in many the injection was irregularly diffused and pale, as if it had been diluted by a soft structure contained in the tube.

Tube of the Pulmonary Artery central to large Tuberculous masses.—In some places the walls of the artery were several times thicker than the diameter of the tube, fibrous in texture, and vascular; the glistening fibres were plainly obliterated capillaries. At other parts, in one or two specimens, the tube of the artery was current through the midst of very large irregular tuberculous masses, from one to two inches in solid bulk. The tuberculous masses formed the walls of the vessels; they were equal in texture, hard, white, of the appearance and firmness of cartilage; the cut surface was irregular; here and there there were small hollows from softening. A few solitary, straight, or tortuous capillaries, took their course in this tuberculous structure; these might be seen at any part of the mass, though many extensive portions were quite void of them. The capillaries differed much in different specimens; they were diffused everywhere, though nowhere grouped into

patches of vascularity; they mingled with an interlacement of fibrous lines.

Lining Membrane of Pulmonary Artery softened; rough in patches.—The lining membrane of the artery, besides being studded with the bright cells, was in some parts soft, rough, and finely mottled, with the capillaries coming close to, indeed upon the surface. The inner membrane was apparently involved in a new capillary development. These softened patches were only observed where there were tubercles. The inner surface of the artery was often roughened by the studding of the minute cells.

Tubercles in the Air-cells near the Pulmonary Artery.—The air-cells were the usual, and, indeed, the characteristic seat of tuberculous development. In many cases, especially in a lung affected by miliary tubercles, the tubercles were clustered in the neighbourhood of the arteries. Where the tubercle sprang direct from the walls of the artery, the air-cells would be in most cases involved; the exceptions being in those cases where the walls of the artery were much thickened by new capillary development.

Here and there, chiefly in the neighbourhood of the most highly injected points, the injection of the capillaries of the air-cells partially failed. The tissue of the lung at these points was usually of a darkish grey, and the structure had a glairy, semi-opaque appearance. The filamentous and webbed walls of the cells were thickened and more than usually opaque. The blood-vessels that were injected ran, in most cases, a direct course; but

sometimes they were tortuous, and in one or two instances they were irregularly bulging. The little bright cells were deposited numerously in these greyish patches. Under a high power numerous minute cells, the size of and like to the secondary cells before described, were observed on the filamentous and webbed walls: in one specimen a large adventitious cell quite filled up an air-cell. In some parts the structure of the air-cells could not be seen by direct light. The whole mass presented a semi-transparent bluish grey hue; vessels ran through many portions of this tissue, especially where it bordered on the vascular air-cells; these ran in one well-marked case in parallel straight lines. One of the semi-transparent patches was very small; in the midst of its structure there were two very minute, opaque, rounded spots: some of these patches were of equal character throughout, but in general they bordered on opaque, whitish yellow, firm-textured tubercles. These tubercles were usually homogeneous, not being studded with the pearly spots that were observed in the tubercles bordering the pulmonary artery; some of them were penetrated by a few unclustered, straight, or curved capillaries; usually the capillaries played on the surface of the tubercle, and were clogged up when they were about to enter the opaque firm tissue.

Opaque Tubercles.— On observing the patches of grey and opaque tuberculous formation by the aid of transmitted light, they were found to comprise the areolar tissue of the air-cells, much modified by the disease, thickened, shaggy, and studded with

the minute cells that appeared to form the bulk of the diseased structure. Many of the opaque tubercles were softened towards the centre in one or more points, so as to form small irregular pits wormed out of a portion of the solid mass; these pits were lined by a flocculent, villous surface, the ragged ends of the, apparently, disorganized structure of the air-cells. The tuberculous tissue neighbouring the pits was soft and friable.

Diffused Tuberculous Granules.—In some portions of the lung there were numerous diffused, small, irregularly-rounded granules, of a rather soft, whitish, tuberculous matter, very near each other, but yet asunder. They were found to consist of tuberculous matter, filling up the interstices of the air-cells, the walls of which were perfect, but thickened, and studded with cells. These diffused, imperfectly grouped, tuberculous patches, were often of considerable extent, and were usually irregular at their margins; here and there vessels penetrated this tissue.

Other varieties of diffused, ill-defined, tuberculous structure, were observed: in one the main texture was white and opalescent, and was crossed in all directions by numerous capillaries; in another there were irregular patches of whitish yellow firm tubercles, in the midst of a vascular, softer, tuberculous tissue.

Softening of Tubercle.—Many of the tubercles were partially softened, and, as it were, worm-eaten in central pits; some were completely softened, and consisted of a white vascular sac holding thickish puriform fluid. The vascularity did not,

except in points, touch the inner surface of the cavity, but a white, soft, easily-separated, shaggy couch was within the vascular wall. The more complete the softening and purulent degeneration of the tubercle, the thinner was the vascular wall and the closer packed were the capillaries; they then, indeed, usually formed a minutely injected close reticulation of tortuous, irregular-sized capillaries. These had evidently sprung forward into new and active capillary formation from the old unobstructed capillaries, when the altered and softened walls allowed the heart's force to push out and prolong the old into the new capillary structure. There was not usually much apparent difference in structure between the bulk of the tubercle and that part of it immediately surrounding the softened portion.

Miliary Tubercles.—The only lung injected with miliary tubercles presented no granular nor softened tubercles; they were quite universally diffused, and were chiefly clustered around the branches of the pulmonary artery, the coats of which artery were much thickened. The capillaries of the air-cells were universally rather large and tortuous in parts; they were of irregular size; the capillaries played around the tubercles, which were hard, of a cartilage-like texture, smooth, and round; but they were nowhere observed to penetrate below an encasing semi-transparent glairy surface. A thin section of one of these appeared to consist of tuberculous matter in air-cells.

Bronchial Tubes.—The lining membrane of the bronchial tubes, where they were not close on a tuberculous mass, was usually rather thick; the

capillaries were reticulated in a normal manner; here and there were studded the glistening cells. In the midst of the tuberculous groupings there were white, uninjected, slightly-raised patches, each coinciding with a tubercle that extended into the air-cells. The vessels were often quite normal up to the margin of the tubercle; some of them sank for a short distance into the texture, being less and less injected; others stopped abruptly short. Here and there a patch of greatly increased tortuous capillary action, on a raised surface, indicated the seat of a tubercle. Most of the tubercles that were in the walls of the bronchial tubes resembled those adjoining the pulmonary arteries, and some of those scattered in the air-cells, consisting of a semi-translucent mass, rendered opaque by pearly spots or fibres

The mucous coat of several bronchial tubes neighbouring the clusters of softened, softening, and broken-up tubercles, was smooth, covered with newly-developed, tortuous, raised, and looped minute capillaries, some of which were irregularly large. They usually grouped into very small prominences, the whole surface being rather villous, but smooth. These vascular walls were thin, without cartilaginous rings, and the whole tube was much dilated. The minute injection suddenly ceased round the whole circuit of the tube, and then a smooth white surface presented, which dilated as it advanced, and became covered with a soft, villous, readily separable new lining; here and there patches of minutely-injected, looping capillaries burst up in raised groups. The dilated bronchial tube ended in one case in a bulbous, enlarged, cavity-like dila-

tation, the walls at the furthest end of which were covered with highly-injected tortuous capillaries; upon this vascular coat was a shaggy inner lining. In other cases the bronchial tube communicated by a continuous surface with a large irregular cavity, formed by broken up tubercles; this cavity being lined by a shaggy coat, which was internal to a more or less highly vascular membrane.

Tuberculous cavities adjoining and communicating with dilated Bronchial tubes.—Close to one of the communicating bronchial tubes were seated cavities containing puriform fluid, lined by two membranes, the deeper vascular, the other villous, and uninjected. It appears that there are two actions going on at once to arrive at the bronchial communication of a tuberculous cavity. There is on the one hand a softening with morbid new capillary formation of the lining of the bronchial tube, and a gradual dilatation of that bronchial tube from the pressure of the atmosphere exerted during inspiration on its softened walls; and on the other, the closed cavity itself extends outwards. The two advancing surfaces where they meet are both involved in the same diseased action; they both form indeed the same disease; each alike softened, each alike disintegrating, at length the partition must give way, not necessarily by sudden laceration, but by the double onward tread of the disease. The surface of the combined dilated bronchial tube and tuberculous cavity, that now form one cavity, is everywhere continuous, composed of one morbidly vascular tunic, which is lined by one thick, pulpy, shaggy, unvascular couch.

If the formation of new tubercles ceases, if healthy replaces diseased action, the tuberculous matter is ejected; the lining vascular membrane becomes fibrous in character, and lined by a smooth mucous membrane. I have had no opportunity of observing this process in an injected lung.

Pleura.—The pleura is always affected by an extension or co-existence of tuberculous pleuritis. The size and course of the new capillaries vary exceedingly, they are invariably tortuous, curved, of irregular calibre; they do not usually bulge forward, loop, or group into prominences, though they often run spirally. They form a rather soft white couch, free from vessels, rather pulpy, not often fibrous in structure, excepting where the tuberculous gives place to a healthy condition. The new membrane, whether in the recent highly-vascular or in the later uninjectable state, is not usually rough, it is sprinkled over with cells, but they are microscopic and can influence only a little the smoothness of the glide on respiration. But the vessels are so large that they thrust up the pleura and cover it with elongated or tortuous bulges; these bulges rubbing against the costal pleura must generate friction and sound.

Tubercles at the surface of the Pleura highly vascular.—In some parts, though in some cases only, (about one half of those that I have obversed,) the new capillaries group into a round bulging patch; this corresponds with a tubercle underneath; when cut into it is found to be the outer surface, the last formed part of an opaque unvascular tubercle, where new ex-

cessive capillary formation still exists. The new vessels over these tubercles are always tortuous, irregularly large, often spiral and looping, leading to one large tubercle. In a case where the tubercles were generally large and loosely developed, and where the large close bladder-like cells existed, there were two or three giant capillaries extending from the plane surface to the raised tubercle; these swelled out to a very great size, and then shrunk in after a tortuous bulging course. The smaller tubercles were tipped with fine tortuous, looped, new capillaries.

Pleural miliary Tubercles.—In the lung affected by miliary tubercles there were many developed hard tubercles on the pleural surface; but there was one that was entirely composed of tortuous vessels; another close to it was white and developed at the tip, but this white tip rode on a bulging group of new tortuous capillaries which had become obstructed towards the central point. The new capillaries on the pleura of this lung were irregularly large and tortuous. On tearing off from the pleura the formed opaque soft membrane, a couch of new tortuous irregularly-large capillaries lay beneath; this was almost universal; in some parts there were two separable opaque layers, and below these a third vascular couch. At some parts the new membranes were irregularly raised.

Capillaries essential to the growth of Tubercles.—From the above observations it results that tubercles require the presence of capillaries for their first formation and growth. The essential and first morbid change is the formation of peculiar cells;

there is a modification in the cell-life of the walls of the capillaries. Wherever the capillaries are met with, there may the morbid change exist. In the walls of the pulmonary artery and in the pleura the tubercles are formed with the aid of new or produced capillaries, and a great part of the structure, or as it were the skeleton, the framework of these tubercles, consists of the walls of the new and obstructed capillaries, often accompanied, even in the most advanced stages, by some blood-carrying vessels. Upon, within, and interstitial to this framework of dried-up new capillary walls, is deposited the peculiar structure of tubercles. On the pleura, the new vessels are irregularly large and tortuous; in the walls of the pulmonary artery they are often quite straight. In both these seats the new inflammatory development of capillaries is absolutely essential to the formation of tubercle, to the carrying out of the tuberculous cell-life. Inflammation then, is as essentially concerned in the formation of the tubercles just referred to, as it is in pleuritis, pneumonia, and bronchitis. In the deposit of grey and the formation of opaque tuberculous matter in the air-cells, the formation of new capillaries is not essential, as the air-cells are so charged with, so completely composed of blood vessels to convey the fluid required for the development of the specific morbid cell-life.

Many of the capillaries of the air-cells are somewhat tortuous, but this is not the usual course: they do not in general appear to be altered; there seems to be an undue capillary activity before the deposit of tuberculous material; but after this is

deposited in, upon, and between the capillaries of the air-cells, many of the smaller interlacements are obliterated gradually; as the tissue condenses more and more disappear, until at length, when the semi-opaque grey has been replaced by the opaque white structure, that structure comprises few or no vessels.

On the lining of the bronchial tubes tubercles are formed sometimes by the development of the original vessels, which nurse the morbid growth; sometimes by the formation and development of new capillaries. In one instance the walls of the bronchial tubes were tendinous and thickened, so as to equal their diameter; this thickening was the result of new vascular development.

In the advanced stage of phthisis, where softening supervenes, the bronchial tubes are always the seat of new capillary development; where the walls become thin and soft, the new capillaries become suddenly blocked up; but farther on, where the bronchial tubes and the walls of the tuberculous excavation combine, the whole lining of the vomica partakes of a new capillary growth.

Points of analogy and difference between Tuberculous disease and Pneumonia.—Much likeness exists between the development of tubercles and that of pneumonia.

In *both pneumonia* and *phthisis* the walls of the pulmonary artery are thickened by a couch, the inflammatory result of new capillary formation; and in this couch new capillaries exist. In *pneumonia,* the capillaries are more numerous and more tortuous than in *phthisis.*

In *both,* the lining membrane of the bronchial tubes is thickened by inflammatory capillary enlargement, ending in sudden obstruction. In *pneumonia,* the capillaries are enlarged over the whole surface, and in the early stages. In *phthisis,* new capillaries are formed in the later stages, or only in the spots where tubercles are being formed in earlier stages.

In *both,* the air-cells are the subjects of increased capillary action, followed by an obstruction in the capillaries, a deposit in the cells, and at length a breaking up of the tissue. In *pneumonia,* the capillaries are uniformly enlarged; their obstruction is complete and early. In *phthisis,* the capillaries are usually only slightly, often not at all, enlarged; their obstruction is usually not complete, but some are left to carry out the later changes. The deposit in the cells, and the formation on their walls is essentially tuberculous.

In *both,* the surface of the pleura is covered by new, irregularly enlarged, tortuous capillaries, which become obstructed and form a new vascular couch. In *pneumonia,* the new capillary growth is everywhere equal; the obstructed capillaries form a thin, equal, fibrous membrane. In *phthisis,* the capillaries are usually equal, but here and there the vessels group into smaller or larger prominences; the obstructed capillaries form an opaque, white, soft, new membrane, on which are frequently studded opaque elevations, or in other words, tubercles. In *phthisis,* the peculiar cell-formation is diffused everywhere.

In *pneumonia,* the new morbid action, where

limited, is defined by the walls of the lobules. In *phthisis,* the morbid action is defined by no particular structure, but may occupy any tissue, and is arrested by its own boundaries, not by the interruption of any established structure. Usually the transition from tuberculous to healthy air-cells is sudden; the former stand out from beside the latter in their solid deformity, as prominently as the lobular patches of pneumonia do from the neighbouring sound lobules.

There is, then, a range of analogies, but a vital difference, between the two diseases: they both infest the same structures; they both work out their mission by parallel steps; but the steps only resemble, they are not alike. They are alike in this: each requires for its development the assistance of capillaries; in each new capillaries are formed where there are no old vessels to give the required aid; in each an inflammatory action is necessarily involved, especially in the pulmonary artery, the bronchial tubes, and the pleura.

But, besides these analogies, there is in a certain class of cases a complete identity; one merges into the other. Pneumonia not unfrequently results in tuberculous deposit.

Inflammatory origin of Tubercles.—Inflammation is unquestionably concerned in the formation of all tubercles occupying the walls of the pulmonary artery and the pleura, in many of those on the bronchial tubes, and in some of those involving the air-cells. Inflammation is probably concerned even in all cases affecting the air-cells. The inflammation is not essential to the disease; it is set up to

furnish the morbid structure with material wherewith to form and reproduce itself.*

First stages of Phthisis.—The earliest stages of phthisis are very seldom recognised; scarcely ever, indeed, as such, excepting where the disease begins to attack a second lung after the first has been ravaged to a certain extent.

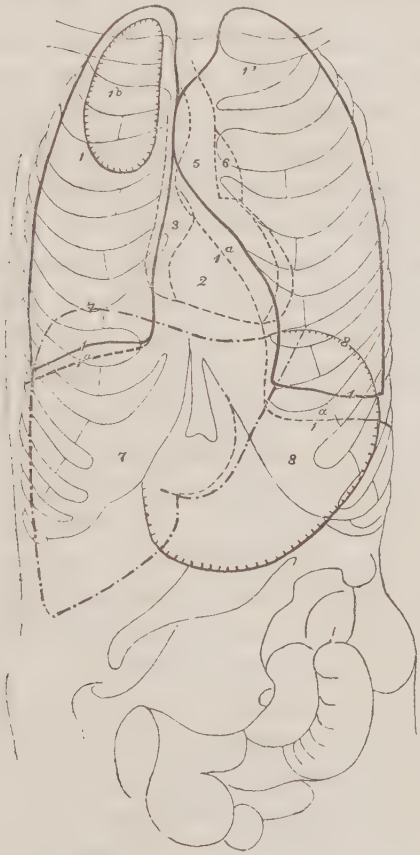
We almost always find the *least diseased lung* to be the *largest.* Active *pleuritis,* without adhesions, exists in this early stage; the walls of the pulmonary artery and the bronchial tubes are inflamed, and the air-cells are infiltrated in patches, probably inflamed.

In pneumonia and pleuritis parallel conditions lead to an undue permanent expansion of the lung. We can say, with certainty, that the least diseased lung in phthisis is generally the largest, and has always the greatest play. I have seen cases in which the expansion of the least affected side seemed to be excessive. I think it reasonable to infer that the walls of the chest are more expanded over the seat of tuberculous disease and tuberculous pleuritis

* I quote the following from Dr. Hodgkin's "Lectures on the Morbid Anatomy of the Mucous Membranes:"—"No doubt exists in my mind, that a miliary tubercle, in the earliest stage at which it presents itself for observation, consists of a minute portion of pulmonary texture, infiltrated by a transparent or translucent substance of a solid or nearly solid consistence, not confined to one cell or cavity, but rather occupying a few of the very minute areolæ of the spongy texture in which the bronchial tubes terminate," p. 153. ..... "It is by no means uncommon to find, in a lung which has been the subject of rather recent pneumonia, collections of yellowish-white opaque deposits, of various forms, and very various extent. Such deposits appear to consist of crude tuberculous matter;" p. 172.

18.—PHTHISIS—TUBERCULOUS CAVITY.

WILLIAM DAVENPORT, AGED 32, PATIENT OF DR. STORER.



1. Right lung; 1*b*. Large vomica; 1'. Left lung; 1*a*.–1*a*. Lower margins of lungs when displaced by artificial distension.—2. Ventricles.—3. Right Auricle.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.

The right lung, besides being occupied by a vomica, was everywhere infested by tubercles, was universally adherent, and was capable of but little distension. The left lung contained many tubercles, but comprised more breathing lung than the right, was not adherent over the lower lobes, and permitted of considerable artificial inflation.

Weight of Organs.—Heart, 10 ounces; right lung, 22 ditto; left lung, 20 ditto; liver, 56 ditto; right kidney, 3½ ditto; left kidney, 3 ditto,

in the very early stage than they are over the healthy lung. The *mobility*, the play in breathing, may be less than in the sound lung, though the *expansion* be greater, just as we observe in pleuritis and pneumonia; but frequently the play, as well as the bulk of the lung is increased.

After Pleuritic adhesions the Costal Walls lessen.—Where pleuritic adhesions have taken place, with tuberculous infiltration into the air-cells, both the bulk and play of the lung in breathing are diminished. The second and third ribs assume the form that they have towards the end of a healthy deep expiration; instead of their costo-cartilaginous junctions being raised and protruded, they are often lowered and depressed. The bulge over the costal cartilages to the side of the sternum gives place to a slope or hollow. The measurement is lessened between the dorsum and the front of the chest over the diseased part; and on a deep inspiration this measurement is proportionally still less. The eye can usually at once decide which is the most affected side, and almost invariably by watching the play of the chest during breathing.

There are many cases of phthisis in which the tuberculous deposit does not come to the surface, and in which there are no excavations that can only be detected by this sign of diminished bulk and play of lung; cases in which no information is conveyed either by percussion, auscultation, or the general symptoms.

The play of the bulk of the sound lung is usually greater than that of the diseased lung; in the latter the lower lobe is less dilated and less lowered, the

costal walls expand less, and the diaphragm does not descend so far either during repose or during the inspiratory action The comparative motionlessness of the upper part interferes with the free play of the lower part of the costal walls. The diaphragm, however, very often descends fully, and is always much more actively inspiratory than the costal walls. In fact, the action of the diaphragm frequently overbalances the action of the costal walls to a great extent on the diseased, to a slight extent on the healthy side of the chest. The same action exists that we find in emphysema and in cases of narrowing of the larynx. The diaphragm descends suddenly at the beginning of the act, and draws down the base of the lung more rapidly than it can be supplied by the influx of air through the larynx; consequently the air is taken from the costal region of the lungs; and the lower part of the sternum often falls in at the beginning and projects towards the end of each inspiration, and is forced out at the beginning and falls back towards the end of each expiration.

The same action often obtains over the diseased portion of lung; the second and third ribs are either stationary or else fall slightly back at the commencement and protrude slightly towards the termination of the inspiration. During the expiration, the opposite effects ensue; the walls are stationary or bulge forward at first, and then towards the completion gradually fall back.

Bulk of Lung lessened from non-dilatation of the Air-cells.—Why does the bulk of the affected portion of lung diminish in phthisis before the stage of

softening and evacuation of the morbid structure? In pneumonia and pleuritis the expanding effect results. The air-cells occupied by the tubercle are certainly not lessened in bulk, but, on the contrary, they are distended by tuberculous infiltration. Wherever a tubercle neighbours it pushes up the pleura; the walls of the pulmonary artery are thickened in the tuberculous lung, and the bronchial tubes are usually dilated, and their lining membrane and fibrous walls are usually thickened where there is not excessive dilatation.

The lessening of the bulk must be due to the non-expansion of the unaffected air-cells. Wherever inspiration would injure an affected lung or portion of lung, or cause suffering to the adjoining diaphragm, costal walls, or parts contiguous to those walls, then breathing is locally suspended, and that lung is in a state of repose. The inflamed or distended tubercles are not at the surface, but in the substance of the lung tissue; the inspiratory distension of the air-cells would stretch and irritate the morbid tissue. The non-expansion of the healthy air-cells that compass those diseased, is the cause of the contraction of the diseased portion of lung when that diseased portion has not advanced to softening and expulsion.

When the tuberculous growth or infiltration softens and breaks down, it forms a sac, at first closed and holding puriform degeneration, that finally communicates with the dilated bronchial tube to form a cavity that receives air during inspiration and gives it out during expiration. The respiratory play of the costal walls over the advanc-

ing disease gradually diminishes up to the time of the opening and free communication of the cavity. The volume of the chest does not necessarily lessen step by step; on the contrary, the advance of the disease, the formation of new tuberculous and puriform matter, often adds to the bulk.

When the communicating vomica is formed and has evacuated itself, the volume of the lung often lessens as the diseased structure is expelled; at the same time the respiratory play of the chest over the vomica is increased as the air is now alternately admitted into, and expelled from a cavity that is seated where a solid block of tubercle or a distended cavity of puriform fluid previously had place. If the lower portion of the diseased lung be consolidated, the walls over the vomica advance during the whole time of inspiration.

Bulk of Lung increased by Tuberculous Infiltration.—In cases of universal tuberculous infiltration, (diagram 16,) the bulk of the lung is increased to the extent of the deepest possible inspiration.

Circulation and Respiration less active in Phthisis.—The vital energies of the phthisical are blunted, the volume of their blood is lessened, the inclination to and the power of exertion is diminished; the mental and the physical man gradually approach through listlessness to torpor. The blunted, torpid frame does not require the volume or energy of circulation that is called for by the vigorous. The blood is less quickly formed from the aliment, the rate of arterialization and waste in the lungs necessarily balances this deficient and bad supply; supply and waste are almost alike

scanty. The waste that in health goes off in fair proportion from the lung, now proceeds in excessive measure by excessive sweats through the skin; while the usual supplying channel, the alimentary canal, now, becomes a positive, new and very rapid drain.

The result of this life-lowering is, that the lungs are not nearly so much required; and although so much of the usable lung be eaten up by the morbid deposit, yet is even this lessened breathing lung not called into full play; the whole volume of both lungs is lessened, the walls of the chest are narrowed and flattened, and the sternum is drawn down. The supra-clavicular space is increased; the summits of the lungs are, although really lowered, (unless distended by tuberculous infiltration,) higher in the neck relatively to the lowered clavicles and ribs. If the tuberculous formation be general and infiltrated, or if it follow pneumonia, the whole bulk of the lung, the capacity of the costal walls, and the descent of the diaphragm, are increased. The disease produces the same parietal and visceral displacements as occur in pneumonia, and as are excited by a deep inspiration. (Diagram 16.)

Heart usually lessened.—The heart where the volume of the lungs is lessened is usually lessened also, but by no means invariably; the experience of some observers is even contradictory as to the general fact; but its diminution bears no ratio to the diminution of the lung, and an unusual portion of its surface comes in contact with the walls of the chest. The bulge over the heart is usually more marked, and the impulse is higher and nearer to the sternum

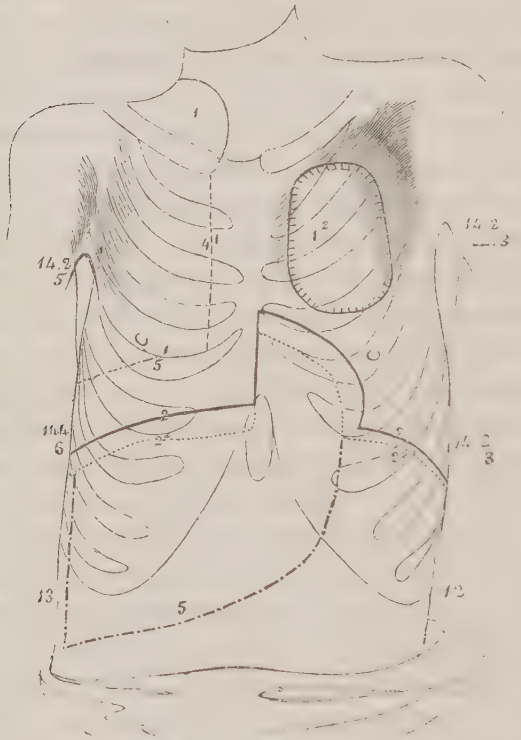
than they are in health. The impulse is often felt behind the second, third, and fourth intercostal spaces, seldom so low as the fifth. If the bulk of the lung be increased by extensive tuberculous infiltration, then the heart is displaced, as it is in cases of pneumonia, slightly downwards and towards the opposite side. If the infiltration be seated in the left lower lobe, as in diagrams 16, and L. 6, then the apex of the heart cannot be felt, the impulse being due to the systole of the right ventricle.

Abdomen more prominent.—The liver is usually enlarged in phthisis, and the volume of the abdomen, from flatulent distension of the stomach and bowels, is increased. The liver bulge is usually very prominent both at the side, and below the depression indicating the lower margin of the lung. The stomach lateral bulge is considerable, but is not usually so great as is that of the liver. The bulge below the heart is usually composed of the left extremity of the liver and the stomach.

Phthisical dyspnœa.—The dyspnœa existing in phthisis is very different from that occurring in and giving rise and growth to emphysema; the inspiration is never complete, but is short and quickly followed by the expiration. If the patient attempt to take a deep breath, it is suddenly arrested by a stitch in the side; a sudden muscular pain. He is obliged when attacked by dyspnœa to pant, to breath very quickly, making up by quickness for want of depth in breathing. The contrasted difference of the expansion of the lungs and chest in emphysema, and of their contraction in phthisis, is regulated by, and due to, the difference in the depth of the inspirations.

L. 6.—PHTHISIS—LARGE VOMICA.

GEORGE HAZELDINE, AGED 20, PATIENT OF DR. HUTCHINSON.



Comparison with Health.—The sternum, clavicles and ribs, and their cartilages, are all lowered, p. 492; the whole chest is narrowed and flattened, p. 492; the summits of both lungs high above the clavicles, p. 492; the chest, over the affected part, 1^2., below the left clavicle, is much *flattened;* the *play*, on respiration, is *diminished*, pp. 488–90–91.

1. Summit of the least diseased lung; 1^2. Very large vomica; (the patient died since the above was engraved; the vomica was one of the largest I have seen;) p. 491.—2. The lower edges of the lungs; $2a$. The lower edges of the lungs on a deep inspiration; the descent on the least diseased side, (right,) considerable; that on the most diseased side, (left,) but slight. Heart's superficial dulness, impulse rather extensive, pp. 492–3; descent of heart's superficial dulness, on deep inspiration, inconsiderable.—4^1. Bound of the heart's deep-seated dulness.—5^1. Upper bound of liver; 5. Liver, large.—The lateral and anterior liver and

Percussion.—In the early stages of phthisis there is a comparative dulness over the affected part of the lung. This dulness, I do not doubt, corresponds with the turgescence in the capillaries that precedes the earliest greyish infiltration. The dulness is not excessive, but well-marked, and after a time it disappears. When the tubercles are formed, but scattered and not very numerous, and when the contraction of the breathing portion of the lung is not great, the percussion is often as resonant over the diseased as it is over healthy or incipiently diseased lung; indeed, if the first stage of partial dulness exist, the lung, in the incipient stages, will be less resonant than in the more advanced stages.

When pleuritis is present—and pleuritis invariably exists in the early stages of extensive tubercular

stomach bulges unusually marked, owing to the lessening and falling in of the chest organs, and the increase in size and protrusion of the abdominal organs, p. 493.

Percussion.—Over the summit of the left lung, dull; of the right lung, resonant; over the vomica, 1^{2}., cavernous or stomach-like resonance. The whole of the lower anterior part of the left lung less resonant than the right.

Respiratory Sounds.—Right lung, coarse crepitations at summit; elsewhere loud and smooth murmurs. Left lung, over the upper part, 1^{2}., loud cavernous expiration and inspiration; hollow, gurgling, or crackling noise. Over the lower anterior part, coarse crepitating noises, accompanied by slight double friction sound.

Vocal Resonance—Generally loud; louder on the right than the left side; louder over the lower part of the left lung than it is over the seat of the cavity; over the cavity, when he whispers, a loud expiratory, whispering, cavernous sound, penetrates the ear; when he speaks, the vocal resonance is accompanied and modulated by the whispering, cavernous, expiration sound, so as to produce pectoriloquy, pp. 200–1.

Heart's Impulse—Felt close to the sternum, over the second, third, and fourth intercostal spaces. Sensation of second impulse over second intercostal space. No impulse at the apex; it is covered, and masked by the consolidated lung. On a deep inspiration the impulse is lowered to the fourth and fifth intercostal spaces.

The figures at the sides denote the measurements on each side, from the spine to the centre in front, under the axilla, over the lower margins of the lungs, and over the lowest edge of the ribs and their cartilages.

formation—then the diseased portion of lung is amplified and the part of the chest that acts on that diseased portion is enlarged. This is but an obedience, on the part of the costal walls and inflamed lung, to the law that invariably obtains in the first stage of simple pleuritis. The bulk of air-expanded lung being increased, the percussion is more resonant when pleuritis exists than it is in the healthy state.

As the summits of the lung, especially the posterior and lateral parts, are almost invariably the parts first attacked by tuberculous affection, to them the chief attention must be given. The best place for comparative percussion of the supra-clavicular region is over the outer edge of the trapezius; the finger that is used as a plessimeter can there be adapted with equal ease and accuracy over the opposite sides, and an equal tap can be given on each. There is, in the region in question, a considerable layer of lung substance to examine, extending from the seventh cervical vertebra to the acromion of the scapula. The part mentioned is quite away from the influence of tracheal echoes, and the finger is not kept off from the costal walls by any great vessels, as it is just above the sternal half of the clavicle. If the arms be well brought down by the sides, the trapezius wraps closely round the first and second, sometimes the third ribs; the bony support the ribs afford is well fitted to conduct the vibrations excited by the percussion tap down to the lung. If the lung be free from engorgement, infiltration, close tuberculous deposit, or closed, or small open cavities, a firm tap

will elicit the resonant sound, characteristic of healthy lung; but if any of those conditions prevail, then the percussion sound will be more or less damped by the diseased subjacent lung.

Where cavities exist near to and below the costal walls, a firm percussion will elicit a peculiar prolongation of the sound. If the cavity be large, and nearly empty, and its walls be thin and firm, a sound is excited, clear, hollow, and ringing, exactly alike in character to the stomach percussion sound, though less prolonged, ringing, and metallic. If the excavation be small the sound is of like character, but less ringing, less prolonged, soon damped; it resembles the sound elicited by percussion over the larynx, but it is a little more ringing. If the cavity contain fluid, the ring is choked, and that sooner or later according to the quantity of the fluid. If the walls are thick, or are separated from the parietes by healthy lung, then the sound is, as it were, muffled; but still there is a distinctive quality given to the percussion sound by the echoing of its vibrations when taken up by the cavity.

The eye is told, by the existence of the characteristic tuberculous slope of the ribs under the clavicle, and by the deficiency of inspiratory movements, that tubercles are present. Percussion, especially if it be employed during a sustained deep inspiration, indicates whether tuberculous consolidation or a cavity exists.

The Respiratory sounds.—In the earlier stages, when there is turgescence of the vessels, effusion of fluid into the air-cells, or local bronchitis with bron-

chial secretion, one or more of the following sounds may be present:—

A crepitating rhonchus that is not so fine as that so characteristic of pneumonia; it is usually rather coarse, sometimes muco-crepitant, sometimes mucous; it is most frequent during inspiration, being sometimes heard towards the end of the act, sometimes during its whole course, when it usually ends in two or three coarser crepitations. It is, doubtless, indicative of the first semifluid effusion into the not altogether obliterated air-cells, or of the existence of mucus in the smaller bronchial tubes. Hissing and cooing, sonorous, or reed-toned noises, usually sharp and feeble, are also heard, especially on taking a sudden deep inspiration. Any abnormal inspiratory or expiratory noise, if confined to the upper portion of one or both lungs, leads to the suspicion of tuberculous formation.

Pleuritic friction sound.—Pleuritis is indicated by a friction sound; this is of a hissing or rushing, slightly interrupted character, and resembles puerile respiration; it is louder during inspiration than expiration; but it is usually present during expiration, and it is audible when the patient whispers; it occasionally gives a peculiar, fine, buzzing, accompaniment to the vocal vibrations. If such a sound be heard, suddenly ceasing, either above or below its seat, and giving place to a gentle murmur during inspiration, and either to a very feeble murmur or to silence during expiration we are assured that it is a friction sound. This sound is very often heard just above the partition between the upper and middle lobes.

The friction sound is very seldom heard in a lung that is contracted by the advance of tuberculous disease, as adhesions have almost invariably taken place, and as but little air is drawn, during inspiration, into the slightly expanded lungs. In such cases the respiratory murmur is usually very feeble, and is often accompanied by an occasional cooing noise, especially if a sudden quick breath be taken.

It is usually over the most healthy, the least diseased, the most expanded and expanding, and the most resonant lung, that the friction sound, commonly taken for puerile respiration, is heard; it is, too, on the least diseased side that the crepitating noise is generally noticed. The fine sonorous or cooing noises are mostly heard on the side where the disease is the farthest advanced.

As *pleuritis* is *invariably* present in the course of the *early stages* of extensive tubercular disease, we may invariably hear the pleuritic friction sound at some time or other during that course. This rubbing sound is quite characteristic; it consists in a shallow, rather loud, hissing, or rustling sound, that is interrupted two or three times during the act of inspiration. These short interruptions of silence give the idea that a body is being dragged over a rough surface, and is arrested here and there by projections, either on itself or on the surface. The noise differs from any other inspiratory sound; once heard it cannot be mistaken. If the ear be placed on the chest, or if the stethoscope be applied very gently, in cases where the pleuritic roughness is not considerable, the respiratory mur-

mur is heard, and there is no rubbing sound; but if the stethoscope be pressed upon the walls, the respiratory murmur is replaced by the friction sound. If a thin layer of wood, the lid of a chip pill box, be inserted into the open mouth of the stethoscope, and if it be then applied gently the respiratory murmur is heard; if any pressure be made, the characteristic rustling, interrupted, rubbing sound is heard louder and more pure, more free from any accompanying respiratory murmur, than it is when generated by pressure from the open stethoscope. This most important sign gives us very early advice of the development of tubercle, and at a time too when local means may be applied to moderate the inflammation. The exertion of pressure brings the two pleuritic surfaces closer to one another, increases the friction, and brings out any sound that the increased friction occasions. When the ear is applied no pressure is made, and the respiratory murmur is heard, as the masking rubbing sound is not brought out. If the pleuritic roughness be considerable, the rubbing sound is heard whether pressure be made or not.

Where pleuritis exists, the play of the lung on breathing, as well as the volume, is frequently increased. The tuberculous differs thus from the simple pleuritis: in the early stages of the latter disease, though the permanent volume of the lung be increased, yet its play is decidedly diminished; in the former, the play and volume of the lung is usually greater than it is in the heathly state.

Cavernous Respiration.—If a cavity be formed, cavernous respiration is heard. This sound varies in quality and loudness with the size of the cavity.

If the cavity be large, it is clear, hollow, and hissing, resembling the noise made by blowing into an empty bottle. The inspiratory noise is more ringing than the expiratory. The sound is formed by the rushing of the air through a narrow opening suddenly into an expanding cavity; the friction of the air so rushing excites a hissing sound, that is carried onwards into the cavity, and reflected in successive vibrations between its walls and centre. The prolonged cavernous vibration gives the hollow ringing character to the hissing sound. The expiratory sound is alike hissing with the inspiratory; it is often louder, and has a peculiarly flat, hollow, character, somewhat modified from the ringing stamp of the inspiratory sound; it gives the impression of air rushing out of the cavity.

It is important to know well the difference in character between the expiratory cavernous sound and the expiratory friction sound; there is great similarity between them; but the latter is more superficial than the former, it has no hollow character, and seems to rush as it were quickly past, whereas the former penetrates the ear.

Pectoriloquy.—When the patient whispers, the loud, penetrating, cavernous expiratory sound is heard; when he speaks, the vocal resonance acquires a ringing character, from the modulation given by the cavity to the adopted vocal vibrations. This modulation gives the impression that the vocal vibrations are stronger over the cavity; but on applying the hand this is often found not to be the case; sometimes, indeed, they are weaker, and yet the vocal resonance appears louder. The most

important modification of the vocal resonance is that given by the expiratory whispering, hissing sound, which is excited and heard during speech, and which modulates the vocal vibrations, giving them a penetrating and confused, almost tremulous, character. After the vocal resonance has ceased, it always does so towards the end of a word, the hissing whispering noise is audible by itself for a short time. If the attention be fixed on the hissing sound it can be heard separately during the whole duration of the vocal resonance. The effect of chest speaking, pectoriloquy, is due to the penetrating respiratory friction sound, which accompanies and modifies the vocal resonance.

The cavernous sounds vary much in different subjects; the variations are dependent on the size of the cavity, the quality of its walls and the amount of its contents. The ringing sound is often inaudible when the cavity is small or contains fluid.

Gurgling Metallic Tinkling.—If there be fluid contained in the cavity, it collects, in part, at the opening; the air passes through it in interrupted jets; what would have been a mucous noise in a bronchial tube gives the effect of gurgling, of, as it were, bubbles breaking with something of a ringing noise, as they do on the surface of boiling water in a deep pot. This gurgling sound is very various; sometimes a few ties are heard, each of which has a ringing sound. In some cases every click or noise, however excited in or near the cavity, has a metallic tinkle or very sharp ring. This resembles closely the noise heard in the stomach when the agitation of its liquid contents excites sound, and

when that sound is prolonged in a sharp ring by the cavity of the stomach, which takes up, reverberates, and prolongs the noise. The difference between the sound excited by a struck tuning-fork when held in the air, and that which it brings out when the tip is placed on a hollow box, gives an idea of the method in which a cavity modifies a sound by taking it up and prolonging it. In the case supposed, the walls of the box vibrate as well as the air in the cavity; and wherever there is metallic tinkling it is probable that the walls have a vibrating quality. We know that they have in pneumo-thorax, and the tense walls of the stomach and the firm walls of some cavities surely have a resonance of their own; whether the solid walls have or not, the cavity is quite able to prolong the sound by its echoes, so as to give it a metallic ringing character. The sharper the first noise, the sharper and more metallic is the ringing response in the cavity.

I have not myself met with metallic tinkling in a pulmonary cavity, though I have heard it on several occasions where there was confined effusion of air in the pleuritic cavity.

The mucous and gurgling noises generated at the mouth of the cavity, sometimes only exist at the beginning of the inspiration and at the end of the expiration, thus differing from the sonorous and mucous noises in the narrowing bronchial tubes affected with bronchitis, which are often only present at the end of inspiration and the beginning of expiration. I suppose the cavernous modification is due to the rushing in of air, driving away the mucus, enlarging the cavity, and allowing the

mucus to slide into the depending hollow of the vomica, thus leaving the inlet uninterrupted; and that the expiratory contraction of the cavity brings the fluid gradually nearer to the outlet, which it at length clogs, so that the air at last passes out in interrupted jets.

When the patient coughs, a loud ringing, hollow, rushing noise is heard, more characteristic than any sound that either voice, whispering, or breathing, gives birth to. This sound was prolonged backwards in one case, that from which diagram L. 6 was taken, immediately after the cough; the resilience of the walls of the cavity seemed to jerk them back to their former dimensions, independently of the expanding influence of inspiration, which had not, indeed, yet been exerted.

Vocal resonance is in general unusually feeble over the lessened, partially condensed, tuberculous lung, prior to the formation of a cavity. If the distance between a cavity and the walls of the chest be considerable, the resonance is feeblest on the affected side.

Heart's seat and sounds in Phthisis.—The heart usually touches the surface over a large space. The second diastolic impulsive sound is often heard very loud and ringing over the second left intercostal space; the systolic impulsive sound is also usually loud. The heart's sounds are generally heard over a great extent; the heart and its sounds descend on a deep inspiration.

Phthisis involves Inflammation.—The causes and general history of the first symptoms in phthisis all tend to prove that it is essentially a disease involv-

ing inflammatory action. The skin is susceptible of the influence of cold in those liable to phthisis, whether that susceptibility be the result of transmitted feebleness of constitution, or confinement and want of exercise, or deficient food, or mental depression. Exposure of the skin to cold, especially after perspiration, excites catarrh and slight rigors, followed by heat of surface and fever; adhesive sputa are expectorated, which are, in a very great proportion of cases, mottled with spots of blood. The bloody sputa form another point of analogy between pneumonia and phthisis. The progress and winding-up of the disease is still marked by symptoms of inflammation.

Source of Blood in Hæmoptysis.—It is difficult to assign the source of the large, sudden evacuations of blood, so common towards the later pages in the history of the consumptive. The seat from whence they spring can but seldom be found on *post-mortem* examinations. But they doubtless spring from the softening walls of the tuberculous cavities, which are vividly supplied by blood-vessels. The pulmonary artery is especially the seat of tuberculous disease; I doubt not that its walls often give way by the onward spread of the degenerative structure; the inner lining becomes softened, pulpy, and broken up, while the neighbouring tuberculous disease is rapidly degenerating. Another probable source of hæmorrhage is the giving way of the minute, highly-ramified vessels in the softened walls of the bronchial tube; but this is included in the previous hazard, as to the softened walls of the vomica being the fountain of the blood. The quiet-

ness, and the freedom from cough and from any irritation in the larynx or lungs, which so often exist during alarming hæmorrhages from the lungs, are well worthy of reflection.

OTHER DISEASES IN WHICH THE LUNGS ARE WHOLLY OR PARTIALLY DIMINISHED.

Diminution of the Lungs and narrowing of the Chest, with descent of the Diaphragm, from Constriction of the Larynx or Trachea.—The general narrowing and inspiratory falling back of the costal walls, owing to excessive and ineffectual diaphragmatic contraction and descent, in those subject to great constriction of the larynx or trachea, has been already stated. (See page 371.) In such cases, the descent of the diaphragm displaces the lungs downwards; and as the air cannot find its way through the narrowed inlet into the lungs so rapidly as to supply the extent of lung displaced, the atmospheric pressure pushes back the costal walls upon the lungs. The same process goes on to a smaller extent in the emphysematous and in the phthisical in certain stages.

Diminution of the Lungs, narrowing of the Chest, and elevation of the Diaghragm from frequent Irritable Cough.—Many persons whose lungs are free from disease are subject to frequent distressing cough, brought on by the slightest exposure to cold, such as leaving a room, going out of doors, getting up from between the warm sheets into the comparatively cold air of the bed-room, exposure of the unprotected skin to cold in voiding urine. Such

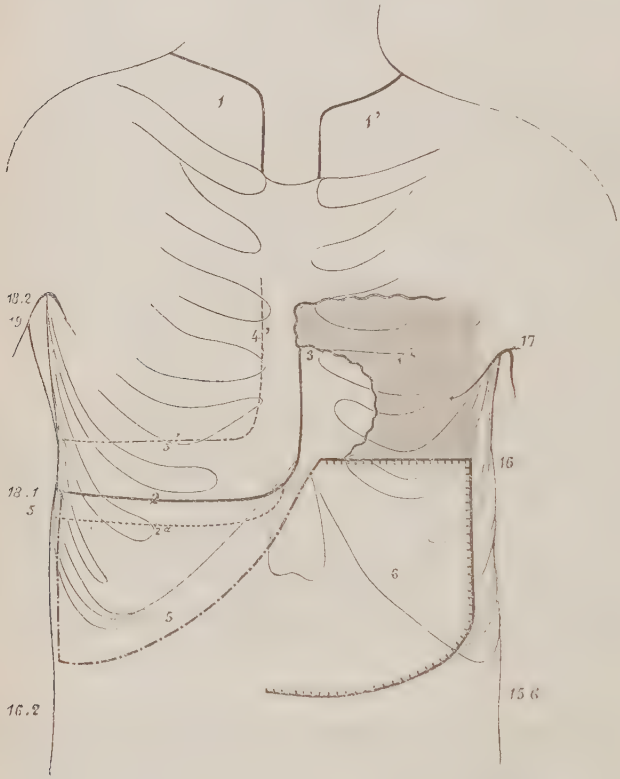
persons are the subjects of constant cough in cold, damp weather; frequently, either a full meal or want of food will excite the cough. There is no attempt to draw in frequent deep inspirations; if there be, the inspiration is soon cut short by an attack of coughing. The violent expiratory exertion of coughing excites panting dyspnœa. The patient attempts to relieve himself by numerous short rapid inspirations. The cause of this irritable cough is the excessive susceptibility of the skin to the impression of cold. The result is a general gradual diminution of the bulk of the lungs. The chest becomes narrowed, the diaphragm is gradually raised, and the abdominal organs become disproportionately large.

Abdominal Distension a cause of narrowing of the Costal Walls, diminution of the Lungs, and raising of the Diaphragm.—The influence of abdominal distension and enlargement of the liver and spleen, in pushing up the diaphragm and lessening the volume of the lungs, has been already noticed. (See pp. 342–4–6.)

Causes of contraction with consolidation, or simple contraction of one Lung or portion of a Lung.—Where the inspiratory movements of one side of the chest, although the lung of that side be quite healthy, would give pain to, or increase inflammation in a contiguous part, as the scapula or shoulder joint, then that side of the chest does not expand during inspiration; it is constantly narrow and motionless; the lung is compressed and shrunk up.

L. 7.—CONTRACTION AND CONSOLIDATION OF THE LOWER LOBE OF THE LEFT LUNG.

JOHN WILCOCKSON, AGED 40, LABOURER, PATIENT OF DR. DAVIDSON.



1.–1'. Summits of the lungs; 1*a*. Consolidated contracted portion of the left lung.—2. Lower edges of the right lung; 2*a*. Lower edges of the right lung lowered by deep inspiration.—3. Heart's superficial dulness.—4'. Heart's deep-seated dulness.—5'. Upper bound of the liver; 5. Liver.—Dotted line. Stomach.

In contraction and consolidation of the lung the ribs fall in, during inspiration, over the affected lung.

The figures at the sides denote the measurements on each side, from the spine to the centre in front, under the axilla, over the lower margins of the lungs, and over the lowest edge of the ribs and their cartilages.

Where a lung or portion of a lung is consolidated and contracted, there the costal walls, instead of having, during an inspiration, the usual inspiratory, have, on the contrary, an expiratory movement. The costal walls contract on the consolidated portion of lung, when an inspiration permits a portion of the consolidated mass to find its way into the expanded portion of the chest; the diameter of the contracted portion of lung is lessened as the bulk of it is elongated; consequently the pressure of the atmosphere forces the costal walls back on the narrowed portion of lung.

If the lower lobe be contracted and consolidated, the opposite lung becomes unusually dilated, and it and the heart encroach somewhat on the affected side; the diaphragm and the abdominal organs below the healthy lung tend over, to a certain extent, to the affected side.

THE HEART IN THE STATE OF HEALTH.

On the Heart.—The usual position of the heart, its cavities, valves, and great vessels, has been shown already at pp. 322–30, and may be seen in the first seven diagrams. The influence of a deep inspiration in lowering all these parts is detailed at pp. 364-6, and is illustrated in diagrams 6, 11, 12, 13, and L. 1 and 2.

During the years 1835 and 1836 I measured the valvular communications and great vessels of the heart. By inserting a graduated cone into the vessels or outlets, I ascertained, their respective

diameters. After a time I injected the cavities of the heart with plaster of Paris; when the plaster had hardened I cut out the casts of the cavities thus formed; I dipped each of the casts into water, noticing how much water the cast of each auricle and of each ventricle displaced; I also measured the dimensions of the various vessels and communications. I did not arrive at a perfectly accurate estimate of the relative proportion of the cavities, and their outlets and inlets, by these means; but, as an approximation, I venture to make the subjoined statements:—

Relative dimensions of the Auricles, Ventricles, and Great Vessels.—In a girl, 14 years old, both cavities of the heart were enlarged; the injection distended the left cavities as completely as the right. The casts of the right and left ventricles displaced each the same quantity of fluid, viz., three ounces and six drachms. The cast of the right auricle displaced the same amount as that of the right ventricle, viz., three ounces and six drachms. That of the left auricle displaced two ounces and six drachms. If this example be a fair criterion, and I think it is, it may be stated that each ventricle contains, when distended, the same amount of fluid. If the ventricles empty themselves completely during their contraction, they must each hold the same quantity of blood. In the average of contractions, the same quantity of blood that is sent from the left ventricle must have been sent to it by the right ventricle, during an equal number of pulsations. During an inspiration the right ventricle receives and sends forth more blood than the left. During an expiration the left ventricle dis-

charges more blood into the system than the right does into the lungs; but the two ventricles balance each other exactly, in the course of six or seven beats, of two or three inspirations. (See pp. 374–5–6.)

The right auricle and right ventricle contain about an equal quantity of blood.

The left auricle holds about three-fourths less blood than the left ventricle.

In the heart just referred to—

The pulmonary artery was.....	$\frac{6}{10}$ths of an inch in diameter.
Each pulmonary vein was about ...	$\frac{1}{2}$ an inch ditto.
The aorta was	$\frac{65}{100}$ths of an inch ditto.
The superior vena cava was	$\frac{7}{10}$ths of an inch ditto.
The inferior vena cava was	1 inch ditto.

The communication between the right cavities had a long diameter of one inch and three-tenths; but as this opening is irregularly oval, its area is not expressed by its diameter; perhaps its area was four-fifths of the area of a circle of the same diameter.

The same remark applies to the left auriculo-ventricular opening, whose long diameter was about one inch and two-tenths; the area of this opening was, perhaps, five-sixths of the area of a circle of like diameter.

About 16 inches of the aorta would hold the contents of the left or right ventricle;

About 12 inches of the pulmonary artery,

About $9\frac{1}{2}$ or 10 inches of the combined pulmonary veins,

About 7 or $7\frac{1}{2}$ inches of the combined venæ cavæ,

About 8 or $8\frac{1}{2}$ inches of a tube, the calibre of the right auriculo-ventricular communication, and

About $8\frac{1}{2}$ or 9 inches of a tube, the calibre of the left auriculo-ventricular communication, would hold the contents of either ventricle.

Experimental observations of the motions of the Heart.—I have observed the motions of the heart in the ass in more than one instance. I injected into the jugular vein from two to three grains of the wourali poison, that was supplied to me by Mr. Waterton; I kept up artificial respiration, removed the ribs, and exposed the heart. In one ass the heart continued to beat for four hours with full energy; at the end of that time the animal showed signs of returning sensation; I cut out the heart while beating with full vigour. The struggles of the animal did not cause any back-flow of blood into the tied jugular vein through which the poison was injected; the vein swelled behind the ligature. To ascertain the gliding movements of the heart, I fixed pins first into one part, then into another, of the moving walls.

Gliding movements of the Left Ventricle.—During the ventricular contraction and auricular distension, the apex of the ventricle became hard and firmly pointed; it felt like the pushed revolving point of a pencil. To the eye, the apex scarcely projected at the beginning of the systole, but the applied finger was lifted up and pushed forwards. The point of the apex gradually approaches the base of the ventricle, moving meanwhile from right to left; at the end of the systole it is bent over to the left, and is about one-third of an inch nearer the left auricle, than at the beginning. While the point of the apex moves from right to left, the increasing cone of the left ventricle, for about one-third of its length, has a revolving motion from left to right. The ventricular walls have

no lateral glide at about the distance of two-thirds from the auricle; between this zone of comparative rest, and the auricle, the walls of the ventricle move from right to left. In other words, while the apex moves from right to left, the walls of the ventricle near the apex move from left to right, and those near the auricle move from right to left. The posterior walls of the left ventricle have gliding lateral movements, the exact opposite in direction to those in front; those near the apex being from right to left, while those near the auricle are from left to right.

Wherever the junction of the left ventricle to the auricle can be observed, the apex and the base of the ventricle approach each other steadily during the whole systole. The upward and backward movement, or that from apex to base, extends from the point of the ventricle to within half an inch of the auricle; there is here a zone of comparative rest; between that zone and the auricle the motion is from above downwards and forwards, or from auricle to apex; the vertical ascending movement is most extensive towards the apex.

The outer and posterior wall of the left ventricle, that on which the columns of the mitral valves are attached, moves steadily inwards during systole. That portion of the wall close to the right ventricle advances slightly, and the front wall behind the right ventricle appears to advance also.

While these ventricular systolic movements take place the aorta is drawn downwards about a quarter of an inch.

When the auricular attachment of the ventricle descends, moves forward, and approaches the apex, the left auricle steps forward and downward into the place just occupied by the ventricular base. The whole auricle and the pulmonary veins become distended, the auricular portion of the auricle fills, and advances steadily forward for about half an inch. It appears as if the distending auricle lifted up, tilted forwards, and displaced the contracting ventricle. The walls of the previously filled, bulging, relaxed right ventricle become suddenly tense, and quickly and steadily fall back and become flat.

Gliding movements of the Right Ventricle.—The distance between the right auricle and the ventricular septum rapidly diminishes. The auricular edge moves extensively from right to left; the edge, at the ventricular septum, has the motion of the adjoining left ventricle, by the movements of which it is dragged. The anterior and upper fibres, those near the pulmonary artery, move from right to left, while the fibres near the apex move from left to right.

The fibres of the inferior wall of the right ventricle become suddenly straight and tense at the beginning of the systole; and though the fibres shorten, the straightening of the bellying walls at first overbalances the muscular shortening, so that the end near the apex protrudes and seems to lift forwards the apex. The auricular attachment moves gradually forward, the auricle replacing the ventricle. The lower border of the right ventricle, and the outlet at the pulmonary artery, gradually approach each other during the systole; the walls everywhere

move from below upwards, with a diagonal movement from right to left, until within about half-an-inch of the pulmonary artery; there the walls are stationary; between that point and the artery they move from above downwards. The pulmonary artery is dragged downwards, about a quarter of an inch, by the neighbouring descending fibres of the right ventricle.

The right auricle, previously flaccid, is gradually distended during the ventricular systole; the auricular portion, before scarcely perceptible, becomes swollen, and advances boldly and rapidly forward from right to left, for about two-thirds of an inch.

Auricular Contraction and Ventricular Distension.—Immediately on the termination of the systole the walls of the ventricles become flaccid, those of the right ventricle advance instantly forward to their former position, and from being rigid, flat, and contracted, become flaccid, swollen, and bulging; at the same time the venæ cavæ first, and then the body and auricular portion of the right auricle, rapidly contract. The auricular walls are comparatively tense during this contraction, immediately after which the auricle gradually fills.

The left ventricle becomes lengthened, its apex descends and moves to the right, its muscular fibres become flaccid, and the posterior walls belly out and move backwards during the diastole; the movements of the left auricle are parallel with those of the right.

Vermicular contractions.—The muscular movements commence in the veins, the venæ cavæ on the right, the pulmonary artery on the left side.

A slight wave of venous contraction propagates itself to the body and auricular portion of each auricle; this venous contraction is concurrent with the second sound and with the second slight dancing pulsation (see p. 332) of the jugular veins. Is not that second pulsation the same with the vermicular venous contraction?

Immediately after the ventricular systole, the auricles contract and the ventricles expand. The walls of the auricles still embrace closely the blood that is propelled forwards through the auricles into the ventricles, by the recoil of the walls of the arteries stretched during the systole. (See p. 332.)

The vermicular contractions appeared to be propagated from the auricles to the posterior walls of the ventricles; thence they seemed to affect the fibres of the right ventricle onwards to the pulmonary artery, and those of the left ventricle, from right to left, then from behind forwards, and finally from left to right. Undulatory contractions are observed, during the systole, to traverse the ventricle from auricle to apex.

The left auricle was unusually filled during the inflation of the lungs. If the artificial respiration ceased, the left auricle became more and more contracted at each beat, until at length no distension nor forward movement of the auricular portion took place during the ventricular systole.

Effects of arresting the Systemic and Pulmonic Arteries and venous circulation.—On arresting the flow of blood through the pulmonary artery by pressure, less blood was sent into the left auricle at the very next beat; the quantity of blood dimi-

nished at each successive pulsation; and after eight or nine contractions of the heart, the auricular portion was quite inverted, and the auricle appeared to be empty. The right ventricle became swollen but not distended; regurgitation was evidently permitted. The right auricle was permanently distended; the auricular contractions took place, but were feeble.

On compressing the superior vena cava, the right auricle and right ventricle during diastole were expanded to only about half their previous bulk; the left auricle and the left ventricle became smaller.

On compressing the aorta, the right auricle was less distended at the very next beat, and became progressively less during the next eight or ten pulsations, after which, it as well as the right ventricle, held but little blood; meanwhile the left cavities became distended, and the left ventricle acted violently; on diastole, the distension was relieved. On removing the compression, the right auricle very soon became swollen, and the heart's action became rapid and violent.

On compressing the left pulmonary veins the right auricle, after a few beats, received less blood; the contractions of the right auricle and of the ventricles diminished in extent and frequency. On removing the compression the action of the heart became powerful and rapid.

Change of the Axis of the Ventricles during Systole.—The heart was cut out when beating with full vigour; the left ventricle was opened through the right ventricle and interventricular wall; during systole the two fleshy columns contracted and approached

each other; the ventricular wall between them moved steadily inwards towards the septum.

The left ventricle may be styled the centre pivot of the heart; it is fixed in its place, in relation to the lungs, by the attachment of the pulmonary veins. The varying distension, and contraction, of the auricle appear to lift up and tilt forward, or draw backward, the auricular attachment of the ventricle. During the systole the fleshy columns approach, and form, with the advancing wall of the ventricle the columnæ carneæ and the right tendinous valvular web, the systolic outer wall. The anterior walls advance, the cavity changes its place, being more to the right, and with its axis, which was formerly in the direction of the auricle, now pointing to the aorta. The contraction proceeds in a twisting manner; the blood is, as it were, wrung out of the cavity and with a current that naturally takes the twisted direction of the spring and arch of the aorta.

The right auricle has its attachment to the system, and a hinge of movement from side to side, in the ascending and descending venæ cavæ. The upward and downward gliding movements have their bearings on the hinges of the left auricle, the pulmonic veins; and the side-to-side gliding motions have their bearings on the hinges of the right auricle, the venæ cavæ.

During the systole the fleshy columns contract, and stretch the tendinous cords and webs between the right auricle and the right edge of the ventricular septum; the septum at the same time bulges forward, and makes a prominent wall, over which

the valves wrap close; the valves form, indeed, during systole, the posterior wall of the ventricle. The axis of the right ventricle, before directed from left to right towards the auricle, now points from below upwards and backwards towards the pulmonary artery.

A second impulse is often felt in persons whose lungs are diminished, and whose great vessels come close upon the sternum. This is synchronous with the second sound, and must, I conceive, be due to the sudden springing forwards of the walls of the right ventricle after systole. A loud ringing second sound is often heard over the lower part of the sternum, over, indeed, the whole right ventricle; this is more ringing than the usual second sound, and is deadened by the interposition of lung, or of a plate of wood inserted in the open end of the stethoscope. Is not this second sound impulsive, and due to the rapid return of the ventricular walls upon the sternum and costal cartilages? This sound is never heard over the left ventricle; it is particularly discernible in emphysema over the xyphoid cartilage, when a deep inspiration is taken.

The impulsive systolic ring heard over the region of the heart's superficial dulness, has been noticed at p. 329. On applying the stethoscope to the walls of the heart, the systolic ring was loud and prolonged; on interposing a film of lung, or inserting the wooden plate, the ring was not heard, but instead, a dull systolic rumble.

Change of seat of impulse induced by change of posture.—I have only observed the change of the seat of

impulse induced by change of position in one healthy person, an adult of full size. When he lay on his back, the impulse of the apex was felt between the fourth and fifth ribs, just below the nipple; the fifth rib was slightly heaved up. When he lay on the left side, the apex was felt beating strongly between the fifth and sixth ribs, an inch or more to the left of the nipple. When on the right side, the impulse of the apex could not be felt; there was gentle heaving of the lower part of the sternum. When he lay on his abdomen, the apex was felt to beat over the third and fourth intercostal spaces. When he sat up, the apex descended from the fourth to the fifth intercostal space.

PERICARDITIS.

Pericardium and Pleura analogous structures.—The serous surfaces of the heart and of the pericardial fibrous sac have the same type of structure with the serous surfaces of the lungs and costal walls. The pleura and pericardium are alike fibro-serous; the basis or framework of each membrane, whether attached or free, is fibrous, aponeurotic; the surface is in each alike serous. Inflammation goes through the same steps on the pleura, and on the pericardium. Pericarditis and pleuritis are alike in essential pathological characters; but as the heart moves with its own energy, and cannot for a second stand still, it is perpetually driving the inflamed surfaces against each other; consequently considerable modifications occur in, and follow pericarditis, that do not obtain during and after pleuritis.

New Capillary development.—I have had several opportunities of examining, through the microscope, hearts that were affected with comparatively recent pericarditis, in which the capillaries of the inflamed structures were injected. The very same general appearances presented themselves that were observed in pleuritis; the old capillaries were enlarged; many of them were irregularly large and tortuous, and raised up the thin and transparent serous lining over a series of loops, the returns of a beautiful spiral disposition of the capillaries. This spiral direction gave a character to pericarditis that the irregularly large, tortuous vessels of pleuritis, from a specimen in the same subject, wanted, and was due, undoubtedly, to the constant alternate tension and relaxation of the muscular fibres.

Usually the enlarged spiral vessels gave birth to new capillaries, having still the tortuous, bulging, spiral, and irregular character of their parent vessels. Here and there clusterings of these new capillaries rose up above the level of the pericardium, lifted up upon them the transparent serous covering, and formed minute papillæ of new capillary growth; some of these were round, others were oblong; others, again, were spread out in large patches, the minute capillaries having everywhere the same character as the parent vessel. The diffused new capillary development was chiefly seated over, and to the side of the coronary vessels. These vessels were, indeed, everywhere fringed with new capillaries, playing spirally at right angles to them, and interlacing in loops, twists, and curves; existing too in every variety of size, from enlarged, bulged out, glo-

bular capillaries, to minute dwindled points. In one heart the parent capillaries were nearly straight in direction, and of equal diameter; the new capillaries were diffused over the whole surface, were fine, equal in size, and scarcely curved; they interlaced at right angles with each other. The larger capillaries just ruffled the surface of the serous membrane; but there were no projections formed by them, they produced no generally raised surface.

Where the new capillaries sprung up in crevices, whose ever-moving sides still rubbed on each other, as at the junction of the right auricular appendix to the ventricle, there a small bundle was drawn, as it were, almost spun out in threads; these filaments stretched from one surface to another, and consisted of parallel, though tortuous, inosculating capillaries. Where the opposed pericardial surfaces each gave forth the capillary growth, the relative movements after coalition spun from each the common threads of union; many of these were stretched, gave way, and lay on the surface of the heart in the looped form that was described to exist in pleuritis; others again formed, side by side, an universal, though loose, large, and extensible union, that yielded with every movement of the heart.

As in pleuritis so in pericarditis, the development of the capillaries was arrested by the very structure to which they gave birth. Some capillaries became infinitely fine, and were at length lost in a point; others that were minutely distributed on the surface, fined off by degrees, and left a white pulpy, vessel-less structure, that gradually became condensed and filled with pearly spots and waved lines; other

capillaries seemed to be choked up. Some very bulging, globular capillaries, seemed to be supplied by others that were exceedingly minute; it appeared as if the supplying vessels would close up, and then the material in the globular bulges would condense into new firm structure.

Tendinous patches the results of Pericarditis.—The tendinous patches in the coronary vessels that are observable on almost every heart, except when taken from the very young, are formed in the manner just described. In almost every heart showing tendinous patches, a beautiful margin of looped tendinous lines fringes the auricular appendices; these are often quite microscopic, but are generally apparent to the eye. I have noticed that the fibrous patches did not exist in one or two fœtal, or very youthful hearts that I have examined; but I have observed them in some obtained from mere infants.

Mild form of Pericarditis.—In many, I may say in almost a moiety of the autopsies that I have made during the last twelve months, of the persons who have died from lingering disease of the chest, or from extensive injuries, as external burns, I have observed, that the pericardium contained about one, two, or three drachms of a pale yellow serous fluid, in which was suspended a flocculent cloudiness; and that the appendix of the right auricle was fringed with soft, lacerable filaments stretching between it and the right ventricle, which filaments had been produced during the alternate expansion and contraction of the auricle. In the same cases there were often new filamentous adhesions between the venæ cavæ and the aorta, and the

adjoining pericardium. In some of these cases, small spots of undue vascularity existed on the walls of the heart, especially over the coronary vessels. It follows from these observations, that pericarditis, in a mild but active form, at some time or other, exists during the life of almost every person.

I have had no opportunity of examining injected hearts affected with pericarditis in the modified and advanced forms. Last summer I examined the specimens of pericarditis in Dupuytren's Museum, at Paris; in Saint Thomas's Hospital; and at the Museum attached to Fort Pitt, Chatham. The latter collection is of unrivalled richness; every variety of pericarditis is marshalled there in choice order. I beg to offer my best thanks to the Deputy Inspector, Dr. Scott, who has made some valuable but unpublished observations on the varieties of the products in pericarditis; to Staff-Surgeon Dr. Kinnis; and to the Curator, Assistant-Surgeon Dr. Mackenzie, for their courteous attention when I examined the Fort Pitt collection. I have not space to detail the full results of the investigation just referred to, but I beg leave to state the following leading facts:—

Minute Papillæ on the Pericardium.—When the surface of the pericardium is exposed, it is usually studded all over with minute papillæ, about the size of pins' heads. In one injected heart (Nos. 1424–5, St. Thomas's Hospital Museum) these papillæ were very minutely injected; in another, (No. 59, Fort Pitt Museum,) several of them were uninjected and white, like islands in the midst of diffused, exceed-

ingly minute, injected capillaries; they resembled somewhat the miliary tubercles on the pleura before mentioned.

Less organized new Membrane, of a lace-like surface.—Superficial to the highly injected, irregularly elevated surface, was a yellowish, apparently ill-organized membrane; this was covered everywhere with minute, shallow, round pits, resembling a honeycomb in miniature, or the mucous membrane of the stomach magnified, or fine lace. In one injected heart many of the highly-injected papillæ peeped through this membrane; their projections, indeed, formed the floor of the depressions, the bases of which had not yet been formed; the appearance was exactly as if a piece of lace were spread over a vermilion back ground.

At some parts of the heart the pitted membrane did not exist; at others it was thick, gathered up in irregular projections, some round, some raggedly pointed, most of them oblong. These irregular papillæ were from $\frac{1}{16}$th of an inch to $\frac{1}{8}$th of an inch in size; combined, they had a shaggy appearance; they were like the fine curled brown seal-skin fur. The surfaces of the projections and of the intermediate depressions were pitted over with the minute lace-like depressions. The base of the right ventricle, and sometimes the apex of the right, and the apex and outside of the left ventricle, the right auricle, and the pulmonary artery, were the most usual seat of these shaggy, brown, clustered projections. They gradually subsided, became smaller towards the body of the ventricle, and at length merged in the simple lace-like membrane.

In many specimens irregular projections, having a more organized appearance, rose up from the pericardium. In others the surface was covered by minute, pointed, oblong projections, exactly resembling the appearance left after the separation of two unctuous surfaces.

In a few specimens a very loosely-adhering, brittle, ill-organized new membrane, of varying smoothness, chipped into, and half peeled off, here and there, as it were plastered the pericardium over.

Prolonged pendulous Filaments.—In many specimens prolonged filaments, of varying thickness, and from half an inch to two inches in length, hung pendulous from the walls of the ventricle, especially near the apex; these often formed filaments of adhesion with the free pericardium; they were of an organized, soft appearance; many of them comprised a congeries of fine threads, while others were solid and bulky. In many places single, long filaments hung down; in some specimens they were mingled with tendinous fibres, evidently the result of the condensation of the softer material.

Section of Pericardium and Heart.—In one heart (Fort Pitt Collection, No. 108) a section is made into the ventricle through the pericardium. In this specimen the muscle is covered by a thick, brownish, dense couch, about $\frac{1}{16}$th of an inch in thickness; outside this is a thin tendinous web, apparently the original fibrous pericardial coat, somewhat thickened; this is covered by a thick, whitish, dense, membrane. This couch is about half a line in thickness, and is coated by a brownish, ill-

organized, outer coating, that is studded over with rather large papillæ. In one specimen the pericardium is nearly an inch thick; other specimens present a villous appearance.

The free pericardium is affected in a manner precisely similar with that which is attached; its fibrous framework is usually much thickened, sometimes to the tenth of an inch; it is lined by a new membrane, having exactly the same character as that on the opposed attached pericardium. If the one be studded with minute elevations and depressions, so is the other; if the one be shaggy, so is the other; and at whatever parts of the heart are seated any peculiarities of shagginess, or projections, or pendulous filaments, opposite those very parts on the free pericardium the peculiarities of the surface are precisely similar. The friction of the one surface against the other evidently gives the peculiarity of the impressions on the opposed surfaces. The varying nature of the gliding, compressing, and separating movements, will stamp the varying nature of the new membrane on the surface; the varying lengths, too, of the pendulous filaments will depend on the varying extent of the gliding motions of the heart's surface on that of the free pericardium.

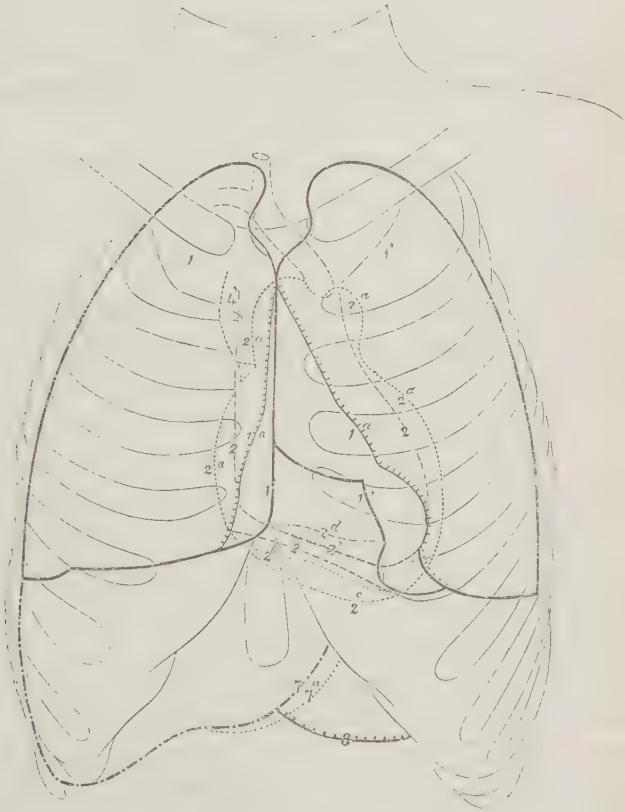
Effusion of Fluid.—In pericarditis, especially in rheumatic pericarditis, the quantity of serum increases in the pericardium with amazing rapidity; sometimes the sac is distended to an enormous size. To ascertain the form of the distended pericardial sac and the displacement of lungs affected by the effusion, I injected as much fluid into the pericardial sac as

it would contain. (Diagrams 4, 12, and 19, in which the form of the distended sac is well seen.) The great volume of the sac surrounding the body of the heart is globular. There is a subsidiary bulge, as it were, an appendix over each of the great vessels; that over the origin of the venæ cavæ is very small; those over the aorta and pulmonary artery combine to form one projecting bulge, depressed in the centre, which bulge sits, as it were, on the top of the great globe holding within it the heart. This upper bulge is immediately behind the upper half of the sternum, and extends to each side of it, fronting and flanking the great vessels; it displaces the inner margins of the lungs, and separates them from each other. The lungs spread away from each other in diagram L. 10, from within an inch of the top of the sternum. As the lungs are kept asunder from the great vessels by the pericardial bulge, they lap partially round that bulge and lie by its side; and they take its direction. The form of the separation of the lungs from each other behind the upper part of the sternum, when induced by, is quite characteristic of, pericardial effusion.

In the subject of diagram 19 the distension of the sac lessened the volume of the heart, by squeezing out the contents of the cavities and raising its lower border. The lungs were pushed much apart from each other; the central tendon, instead of being flat or slightly convex upwards, was pushed down, and formed a bulge into the cavity of the abdomen, which displaced the liver to a considerable extent. (See diagrams 12 and 19.) The same displacements are induced in the living by pericardial effusion.

19.—ARTIFICIAL DISTENSION OF THE PERICARDIAL SAC BY FLUID.

ALFRED DUKE, AGED 36, PATIENT OF MR. WHITE; COMPOUND FRACTURE OF BOTH LEGS.



1. Right lung *before* the distension of the pericardium; 1'. Left lung *before* the distension of the pericardium; 1*a*.–1*a*. Inner margins of both lungs *displaced* by the distension of the pericardium.—2. Outlines of the pericardium *before* artificial distension; 2*a*. Outlines of the pericardium *after* artificial distension by fluid; 2*b*. Anterior margin of the central tendon of the diaphragm, where it is adherent to the pericardium, displaced downwards by the pericardial distension; 2*c*. Downward bulge of the central tendon, caused by the pericardial distension; 2'. Lower boundary of the heart *before* the pericardium was distended; 2*d*. Lower boundary of the heart raised by the pericardial distension.—4'. Vena cava.—7. Liver; 7*a*. Lower edge of the liver displaced downwards by the pericardial distension.—8. Stomach. (See pp. 527–28.)

For instances of pericardial effusion in the living see diagrams L. 9, 10, and 11. In all of them the effusion and the region of pericardial dulness have the form of the distended pericardial sac. The diminution of the sac from day to day, until it results in the perfect restoration of the heart, the pericardial sac, and the displaced organs to their places are shown in diagram L. 9.

Progressive changes of Pericardial dulness.—The mode in which the extent of pericardial dulness diminishes is an almost certain test of the progress of the disease.

If the region of pericardial dulness lessens from day to day, (diagram L. 9,) descending gradually from the upper part of the sternum, and losing the peaked form; if the right boundary steadily approaches to the centre of the sternum; if the left border gradually moves to the right; and, more important than all, if the lower boundary which projects into the abdomen, steadily rises, giving place to stomach resonance, then we may feel assured that the case is advancing steadily to unembarrassed health.

If the upper border, after it has gradually descended with a peaked form, (diagram L. 10,) becomes stationary above the normal upper boundary of the heart's dulness; if it loses the peaked form; if the upper region of dulness rises near the mamma; if the right border becomes stationary; if the left border advances steadily to the left; and if the lower border, after ascending for a time, is arrested in its progress before it returns to the healthy position, then enlargement of the heart, due to valvular disease, has almost certainly ensued.

If the upper boundary, after descending for a time, (diagram 11,) becomes stationary, loses the peaked form, and then again ascends; if the left border steadily increases until it approaches the left side of the chest; if the right boundary, after returning inwards, retrogrades; and if the lower boundary does not resume or approach its place, then enlargement with adhesions, and valvular disease, will have taken place.

Protrusion of the Sternum and Costal Cartilages.—The distension by fluid of the pericardial sac, besides displacing the surrounding organs, pushes forward the sternum and costal walls, elevates the second costal cartilage, and, to a less degree, the third, fourth, and fifth; widens the spaces between the cartilages and ribs, from the second cartilage to the seventh rib; projects outwards the sixth rib, and causes some degree of bulge over the left side, and some protrusion of the slope formed by the lower edges of the costal cartilages.

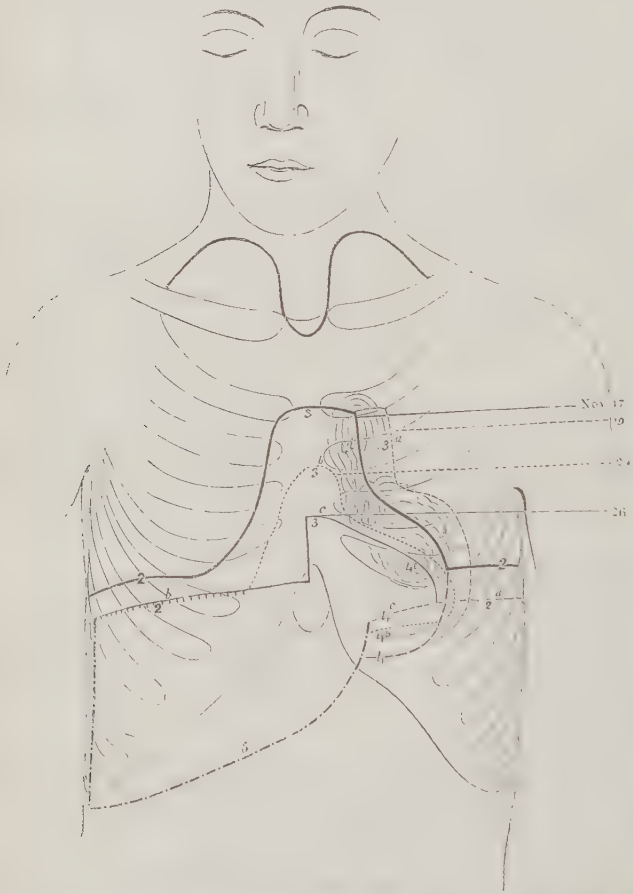
If the fluid diminishes, and the heart returns to its natural size, the protrusion of the sternum and ribs, and the separation of cartilage from cartilage, gradually diminishes, and all the parts return to their healthy position.

If the heart becomes enlarged, the usual heart bulge is increased over the third, fourth, fifth, sixth, and seventh costal cartilages.

If the heart be enlarged with adhesions, the lower two-thirds of the sternum continue to protrude; the separation of the costal cartilages and ribs from each other rather increases; the sixth, seventh, and eighth ribs, project more to the left side; the whole

L. 9.—RHEUMATIC PERICARDITIS.

SYLVANUS REDGATE, 16, TINMAN, PATIENT OF DR. J. C. WILLIAMS; PERICARDIAL EFFUSION; GRADUAL DIMINUTION AND DISAPPEARANCE OF FLUID; RETURN TO HEALTH.



2.–2. Lower margins of the pleura on the 17th of November, 1842.—3. Upper boundary of the seat of pericardial dulness, from effusion, on the first day of observation. The dulness rises very high, up to the first intercostal space, and has the characteristic peaked form of the dulness from pericardial effusion, p. 528–30.—4. Lower boundary of the pericardial effusion, bulging down into the abdomen, and displacing the liver and stomach, p. 528–30.—3*a*. dotted line: Extent of peri-

of the lower left ribs are raised and thrown outwards; the whole of the left side projects; and the sixth, seventh, and eighth conjoint cartilages, to the side of the xyphoid cartilage, are much raised.

Impulse.—The seat and nature of the impulse is more than a right hand assistant to the variations in the extent of dulness in ascertaining the advance of the ailment.

In the subject of diagram 19 the heart was lessened, and its lower border was pushed up by the artificial distension of the surrounding sac. The very same result obtains in cases of pericardial effusion where the heart is not enlarged; the volume of the heart is lessened and pushed upwards towards

cardial dulness on the 19th of November.—4 *d*. The concentric curves indicate the seat of impulse on the 20th of November, when the pericardial effusion pushed up the heart; and the impulse, instead of being behind the fourth and fifth, was behind the first and second intercostal spaces; the third and fourth intercostal spaces were depressed during the systole. The effect of undulation was produced, p. 533–35.

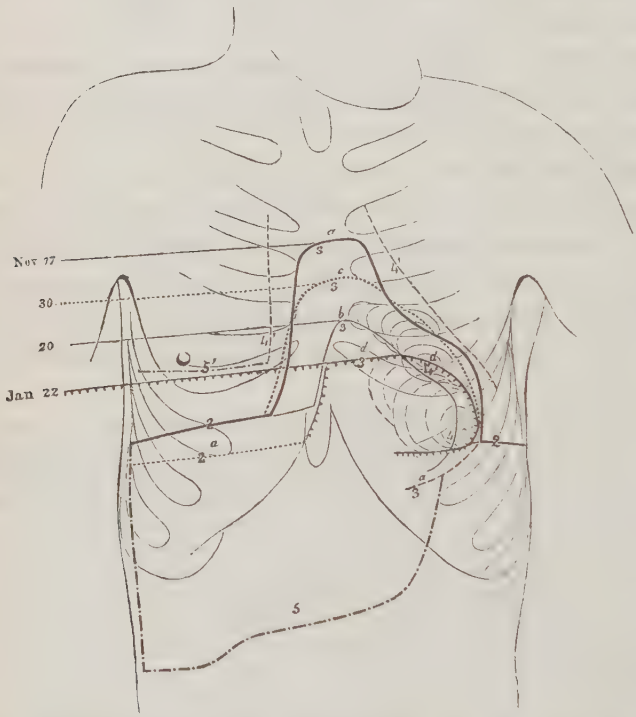
November 17–20.—Over the upper part and middle of the sternum, *normal* sounds to the naked ear, and through the stethoscope, when *applied lightly;* but when the stethoscope was *applied with pressure*, systolic and diastolic smooth *friction sounds* were heard. Over and to the left of the apex, a smooth systolic bellows or friction sound was heard through the closed stethoscope, p. 540. An impulsive silvery noise was heard through the open stethoscope on light pressure; replaced, on firm pressure, by the smooth systolic noise. Below the fourth rib, *i. e.*, below the heart, the sounds were normal under every variation of pressure.

3*b*. Upper boundary of pericardial effusion on the 24th of November, when the extent of effusion was very much lessened; the characteristic peaked form still existed.—4*b*. Lower boundary of pericardial dulness on the 24th of November. Impulse, from the second to the fifth rib. The diastolic and systolic smooth friction sounds were lowered, or rendered inaudible, by a deep inspiration.—3*c*.–4*c*. Upper and lower boundaries of the heart's superficial dulness on the 26th of November, when the pericardial effusion had disappeared. The extent of the heart's dulness nearly normal.—4*e*. Concentric waved curves: Seat of impulse on the 26th of November normally low. All the abnormal sounds, except a slight roughness at the aorta, replaced by normal sounds. Pleuritis existed during the active stages.—2*a*. Lower edge of the left lung on the 26th of November.—2*b*. Lower edge of the right lung on the 26th of November.—5. Liver.

The return to health was complete.

L. 10.—RHEUMATIC PERICARDITIS—ENDOCARDITIS.

JOHN CUMMINS, AGED 12, PATIENT OF DR. HUTCHINSON; PERICARDIAL EFFUSION, TERMINATING IN ENLARGEMENT OF THE HEART AND VALVULAR DISEASE.



2. Lower margins of the lungs on the 17th of November.—3 *d*. Outlines of the pericardial effusion on the 17th of November, having the characteristic peaked form, p. 530.—4 *d*. Concentric lines indicate the seat of impulse at the third and fourth intercostal spaces on the 17th of November.

(On the 17th of November—considerable projection of the third, fourth, and fifth ribs; these ribs are unusually far asunder. Over the upper part of the sternum stethoscopic pressure replaces the previously normal sounds by diastolic and systolic smooth friction sounds. Over the lower part and to the left of the sternum, pressure changes the silvery first normal sound to a musical, almost leather-creaking, systolic, friction sound, indistinct with the second sound. Over the apex and to its left, a smooth, systolic, bellows sound is heard on light, but louder on firm pressure.)

3 *b*. Extent of pericardial effusion, or of the heart's superficial dulness, on the

its point of attachment, the ventricles are raised and seated behind the middle third of the sternum, and the third and fourth, or fifth costal cartilages.

As the ventricles are raised, the seat of the impulse, caused by their contraction, is raised also. In diagram L. 9, where the effusion was very extensive, the second and third costal cartilages, and the first and second intercostal spaces, protruded during the impulse of the ventricles, while the third intercostal space and the fourth costal cartilage fell slightly back, and the fourth intercostal space receded to a still greater extent. These movements of falling back below, while there was advance above, were visible and gave the effect of undulation; while the upper part rose during systole the lower part fell; towards the diastole, when the parts resumed their places, the lower parts rose while the upper parts fell. In the subject of diagram L. 11 the

20th of November, when the extent of effusion was much lessened. The friction sounds excited by pressure, and the bellows sound, were heard lower down than on the 17th.—3 *c*. Extent of the heart's superficial dulness on the 30th of November. The space of dulness had much increased; the characteristic peaked form was wanting.

(On the 30th of November—the impulse is very extensive; it is felt over the two lower thirds of the sternum and the xyphoid cartilage, from the third to the seventh left costal cartilages, and in the fourth and fifth intercostal spaces. Systolic and diastolic silk-rustling, friction sounds, heard loudest on pressure over the right ventricle; normal sounds heard over the aorta; loud bellows, systolic noise, heard below and to the left of the apex; and faint systolic, bellows noise, heard over the sixth dorsal vertebra.)

3*d*. Extent of the heart's superficial dulness on the 22nd of January.—4*c*. Concentric waved curves indicate the seat of impulse on the 22nd of January at the fourth and fifth intercostal spaces.—2 *a*. Lower margin of the right lung on the 22nd of January.

(On the 22nd of January—no friction sounds; over the great vessels, sounds normal; over and all around the apex, systolic bellows noise, which is also heard over the dorsum. The patient is free from pain, and feels well when he does not exert himself. Pleuritis existed during the active stages in this case.)

impulse was unusually high, being seated between the third and fourth intercostal spaces; but the lower spaces and ribs did not fall back, the effect of undulation was not produced.

As the outlines of dulness, due to effusion, diminished in the above cases, the seat of the impulse descended. In the subject of diagram L. 9 the fourth intercostal space was protruded during the impulse; on the seventh day the upper impulse became very feeble, the undulation disappeared gradually as the effusion diminished and the heart and the seat of the impulse descended and resumed their natural places.

In the subject of diagram L. 10 mitral regurgitation from endocarditis existed in the very first stage; this resulted in a gradual enlargement of the heart. The heart and seat of impulse gradually descended, they soon passed their natural seat, and took up a new, a lower and more extended position; the impulse of the apex being more to the left and rather lower than in health, and the impulse of the right ventricle being felt, gentle in character, in the epigastric space, and over the sixth and seventh costal cartilages near the sternum.

In the patient from whom diagram L. 11 was taken, whose case resulted in pericardial adhesions, the impulse, which, in the early stage, was above the fifth rib, gradually descended; the impulse of the apex at length reached the seventh rib, quite to the left side of the chest. The two lower thirds of the sternum and the xyphoid cartilage were pushed forwards at the beginning, and drawn suddenly backwards towards the end of the systole. The impulse, in

fact, was felt over the whole left side. This poor girl died. The heart was enormously enlarged, and the pericardial surfaces were universally adherent. (Diagram 23.)

Friction sounds.—I thrust a needle into the heart of an ass, and withdrew it to the surface so as to scratch the pericardium during the heart's to-and-fro motions. A scratching sound was heard during the interval. On withdrawing the needle a little blood followed. On applying the stethoscope lightly the sounds were normal; on making moderate pressure, a rough planing friction sound was heard during the systole, followed by a normal second sound, and a silent interval; very firm pressure drowned the friction sound in a loud impulsive ringing sound.

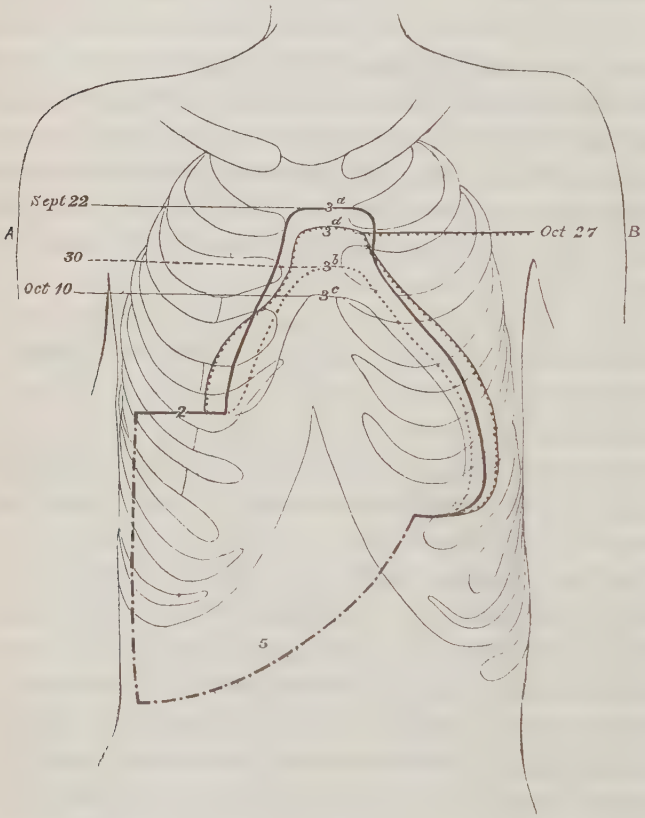
The roughening of the surface of the pericardium in pericarditis varies according to the stage and intensity of the disease.

In the comparatively mild form of pericarditis, (see pp. 523–4,) the chief seat of the products of the disease is over the right auricle and great vessels. The space affected is shielded from examination by the interposed lungs; as there is very little effusion, and no great enlargement of the heart, the lungs are not pushed away from before the seat of the inflammation. If any friction sounds are generated the lungs will mask them completely.

Inflammation does however exist, to a milder degree, over the body of the ventricles; there is at least turgescence. I have never examined a case of this kind during life, but I have no doubt that a faint, smooth, systolic rubbing sound may be heard.

L. 11.—RHEUMATIC PERICARDITIS.

Elizabeth Hooper, 17, Servant, Patient of Dr. Hutchinson; Pericardial Effusion, terminating in Pericardial Adhesions. (See Diagram 23.)



2. Lower edge of the right lung.—3*a*. Outline of pericardial effusion, on the 22nd of September.

On the 22nd of September, eighteen days after the first access of the disease, and four days after the occurrence of a second attack, the outlines of the effusion have the characteristic peaked form behind the upper part of the sternum; the lower boundary bulges into the abdomen, displacing the liver and stomach. Over the sternum, on applying the stethoscope lightly, normal sounds are heard; on gentle pressure, diastolic and systolic smooth friction sounds are excited; on increasing the pressure, the friction sounds over the upper half of the sternum are louder. The diastolic friction sound is accompanied by the normal second sound; over the

In rheumatic pericarditis, and in all the severer forms of pericardial inflammation, the inflammation and its products always give rise to a friction sound. It is but seldom that we have an opportunity of ascertaining the cause of the rubbing sound in any individual case by inspection after death; we never have such an opportunity in the earlier stages; but we have the power of examining the living subjects of the disease from the first onset daily, through all their changes, to the final result. We can then ascertain the progressive changes in the character

lower half of the sternum the second sound is inaudible; over the apex, through the open stethoscope, rough bellows, systolic noise, accompanied by impulsive ringing, almost *cantering* noises, are heard; through the closed stethoscope the bellows noise is loud and smooth, and dissected of the ringing noises, which are inaudible; systolic bellows sound is heard over the dorsum. Impulse, not strong, from the second to the sixth rib.

3*b*. Outlines of the heart's superficial dulness and pericardial effusion on the 30th of September. Friction sounds and systolic bellows sounds varied but little from the former report. Impulse stronger.—3*c*. Outlines of the heart's superficial dulness lessened in extent above, but unchanged in the epigastrium, on the 10th of October.

The friction sounds were feeble, but evident on pressure, on the 4th of October. There were no friction sounds on the 5th of October. Pericardial adhesions date themselves from that day. On the 10th of October, over the upper two-thirds of the sternum, normal sounds; pressure excited no change. Over and neighbouring the apex, through the open stethoscope, loud *cantering* sounds, from three or four impulsive shocks, and rough, sawing, systolic noise; through the closed stethoscope, no *cantering* sound, but equal bellows or sawing noise. Bellows noise below the sternum and over the whole dorsum; no second sound at or below the apex, but present at the upper part of the dorsum. Impulse strong, heaving, and falls back suddenly towards the end of the systole.

3*d*. Extent of the heart's dulness on the 27th of October, when the heart was greatly enlarged and adhesions were established. On the 27th of October the stethoscopic signs do not materially vary since the last report. Extent of impulse is increased. The impulse became gradually more extensive and stronger.

On the 2nd of December the two lower thirds of the sternum, the cartilages to each side of the sternum, and the left ribs, from the second to the seventh, were heaved up gradually and strongly duriug systole, and fell back suddenly at its termination.

The patient died on the 4th of December. For *post-mortem* appearances see diagram 23.

and seat of sounds, and we know the usual progress of the inflammation and its results by a chain of *post-mortem* examinations.

In the early stages of inflammation, where the old capillaries are enlarged, become spiral, and give existence to new vessels, and bulge up and roughen the pericardial surface, the ordinary friction of surface against surface is not sufficient to give birth to a rubbing sound. By pressing gently on the costal cartilage or sternum with the end of the stethoscope, (I employ the flexible stethoscope,) any fluid that may be interposed between the surface of the heart and the costal walls is displaced. The opposed surfaces now touch; if they touched before they are now pressed closer together; and where the normal sounds were heard on light application of the instrument, or on applying the ear, a rubbing sound is now heard, due to the increased and now noisy friction of two turgid surfaces.

That I might apply this pressure with less uneasiness to the patient, I inserted a thin plate of wood (the head of a chip pill-box) into the mouth of the bell of the stethoscope; this diffused the pressure, and had the double advantage over the open stethoscope of giving no pain to the patient and of exciting pressure and increased friction over a greater extent of surface. The friction sounds were conducted as well through the stethoscope with a plate inserted as through the open instrument. We may style this the "closed" to distinguish it from the "open" stethoscope.

In several cases that I have seen in the very first stage, the friction sound excited by pressure was

very gentle and smooth, resembling a soft, smooth, blast-bellows noise, or rubbing together of two layers of fine cotton. In one case increase of pressure changed this to a rustling sound, like the mutual rubbing of silk surfaces; these sounds disappeared for a time after the application of leeches. I think it quite fair to infer that they were caused by the turgid state of the old capillaries, just before they had given birth to projecting groups of new capillaries.

Varieties of Friction Sound.—The character of the friction sound varies considerably, even in the early stages. In some cases it was like a smooth, soft, bellows noise, or like the rubbing together of the opposed surfaces of cotton, or of linen, stuff, or silk; varying pressure often modified the noise, and out of one of these sounds produced the other. very often the sound closely resembled smooth, sometimes rough, planing; sometimes there was a grating sound. In other cases a sound was heard Very like that excited by scratching a deal table with a pin; in one case a plaintive musical sound was heard. All the above sounds may be heard during the middle stages of pericarditis. The leather-creaking sound I have only heard in the later stages. In one case, (diagram L. 10,) there was, during the later stages, a peculiar squeak, that was faint at first, rose gradually, and stopped abruptly, with a sudden rise, as if cut short; this sound gave way to a smooth friction sound. In more than one case the friction sound was closely imitated by rubbing gently on the skin near the stethoscope.

The varieties of friction sound, undoubtedly, answer to the difference in the condition of the inflamed surface in different cases.

All the above sounds may be distinguished during the systole; most of them may be prolonged during the time of the second sound and the interval. All the above sounds may be inaudible by applying the ear or the stethoscope lightly, when they are loud and overwhelm every other sound on firm pressure being made. Very often a smooth friction sound, audible on applying the ear or the stethoscope lightly, becomes rough and harsh, or high and musical, on firm pressure. When the sound is audible on light pressure it is always increased in loudness, often in tone, by exciting firm pressure. In some cases, however, smooth friction sounds have been excited by pressing with the closed stethoscope, when the open stethoscope did not modify the normal sounds.

I have never heard the friction sounds modify the normal sounds beyond the region of the heart, beyond the immediate source of sound.

The friction sound excited over the apex can often be heard without pressure, when that excited over the right ventricle or elsewhere cannot. It is usually smooth, like planing, or silk rustling, or a bellows-noise; it is generally only systolic; sometimes it is prolonged during the time of the second sound, which sound it then overwhelms. In some cases it is continuous, though very feeble during the interval. The friction sounds at the apex are always increased, often prolonged, and still oftener brought into play by pressure.

Impulse Sounds.—Through the open stethoscope loud ringing systolic impulsive sounds either accompany or drown the friction sounds. Sometimes these are followed by a diastolic ringing sound, louder than, though synchronous with, the second sound; it coincides with a sudden perceptible withdrawal of the apex from the walls, and I think it it is due to that sudden withdrawal taking place. These impulsive sounds are not present on the gentle application of the stethoscope; they are brought out by light pressure, and are replaced by friction sounds on firm pressure. In all cases the closed stethoscope quite muffles the impulsive noises, and permits any other existing sound, whether normal, friction, or regurgitation, to be heard, dissected as it were, free of the impulse noises. The plate has the same action as the interposed lung.

Mitral Regurgitation.—If the systolic sound at the apex be heard on very light application, or be not increased by pressure, or be discerned readily by the naked ear, it is usually due to mitral regurgitation; if it can be heard, over some inches, below, or to the left of the apex, or can be distinguished over the dorsum, then the noise over the apex is invariably due to mitral regurgitation.

The sounds over the extreme left edge of the heart, for about an inch above the apex, are due to the friction from the left ventricle, and have the same action with the sounds at the apex.

Sounds over the Right Ventricle.—On applying the open stethoscope lightly over the right ventricle, the normal, impulsive, and rumbling first sound, and the ringing or clacking second sound, are heard.

On light pressure the impulsive sounds are sometimes increased; but generally a to-and-fro friction sound is heard during systole as during diastole, of the same character, though somewhat louder. In most cases there is a short, sharp, impulsive sound at the commencement of the systolic friction, and this often ends with the sharp second sound. Increase of pressure, or the use of the closed stethoscope, will usually render the friction sounds louder, and obliterate the impulsive and second sounds. The sounds over the right ventricle have every variety of character; they are often roughest and loudest about the middle of the sternum. The musical, leather-creaking, and squeaking sounds that I have heard, have always been seated over the right ventricle. The gliding motions of the right ventricle are the most extensive, and the surface of the pericardium is usually the roughest, behind the sternum; and I have usually heard the sounds loudest over the sternum.

Friction sounds over the Right Auricle and great Vessels.—The sounds over the auricular appendix of the right auricle and the great vessels are often to-and-fro, accompanying both systole and diastole; often rougher during systole, but louder and stronger during diastole. In two cases there was only a diastolic sound; in one of these the noise resembled the scratching of a pin. I have heard this pin-scratching sound in three different cases, during the diastole over the left side of the right auricle and the great vessels. If a valvular sound or venous murmur exist over the great vessels, it can be easily detected by tracing back the sounds to the vessels in the neck.

Friction Sounds are raised by the effusion of Fluid.—When great pericardial distension exists, the whole heart being raised and its bulk lessened, each of its parts is of course raised likewise; the apex coinciding with, or being a little below the left point of the impulse. In such cases the friction sounds over the respective parts are heard a step higher; the friction sound is not excited over the lower part of the sternum, or below the fifth rib. When the fluid diminishes the heart descends, and the impulse and the seat of the friction sounds are lowered. The friction sounds are, during this stage of lowering, frequently heard without pressure.

Inspiration lowers the friction sound.—Inspiration usually draws down the heart and lowers and narrows the seat of friction sounds; sometimes it altogether obliterates those sounds. In one case where the pin-scratching sound was very extensively heard, the sound was increased during an inspiration, and was often obliterated during an expiration.

The progress of the friction sounds combines with the onward variations of the extent of the pericardial dulness, of the nature of the pericardial bulge, and of the seat and nature of the impulse, to stamp the character of the progressive changes.

Progress of friction sounds.—If the attack of pericarditis terminate in perfect recovery, as in diagram L. 9, the sounds, at first high, gradually descend as the effusion diminishes. The sounds become very gradually feebler; if a bellows sound exists to the left of and below the apex, it gradually fades away a short time after the region of the heart's dulness has assumed its normal form.

If permament valvular disease with enlargement of the heart supervene, then the friction sounds descend lower and lower, and are at length seated in the epigastrium under the sixth and seventh ribs, and sometimes to the right of the sternum. The bellows sound at the apex becomes gradually more extensive, and at length is heard over the dorsum, all round the apex, and over the lower part of the right ventricle. The friction sounds go away very gradually.

If the result be pericardial adhesion, the adhesion usually first takes place at the apex. In the neighbourhood of the apex, the friction sound generally disappears; the ear, either unaided, or through the open stethoscope, can distinguish a loud double systolic ring, caused by two or three impulsive shocks, ending with a diastolic noise. These noises produce a silvery, sometimes a cantering effect, and overwhelm every other sound. The application of the "closed" stethoscope immediately silences the cantering noise, and permits the valvular murmur to be heard. The friction sounds continue to be heard, for a time over the body of the heart, though much feebler; the rubbing, gliding motion of the heart being lessened after the adhesion of the apex. The progress of the adhesions is usually from below upwards; when the right ventricle becomes adherent, the friction sounds over that ventricle suddenly cease; no modification of pressure can excite them. At the same time the friction noises from the great vessels usually suddenly disappear also; but now and then a case occurs in which the auricular or arterial friction sound con-

tinues, after those over the right ventricle come to an end. The ringing, systolic, and diastolic impulsive sounds, are heard over the right ventricle; these can always be muffled by the closed stethoscope. If the mitral valve be affected, the valvular murmur may be heard through the closed stethoscope over the lower part of the sternum.

Pleuritis accompanies Pericarditis.—Pleuritis accompanies every case of pericarditis of any severity; it usually affects the left lung, first attacking it in the neighbourhood of the pericardium, either behind the second, third, or fourth costal cartilages, or over or near the apex; the pleuritis generally extends round to the dorsum. The pleuritic friction sounds excited near the apex and over the dorsum are easily distinguished from the heart's friction sounds. The dulness on percussion that often exists in pleuritis, prevents the pericardial effusion from being accurately mapped out. Very often pleuritis prevents the inspiratory motion of the chest.

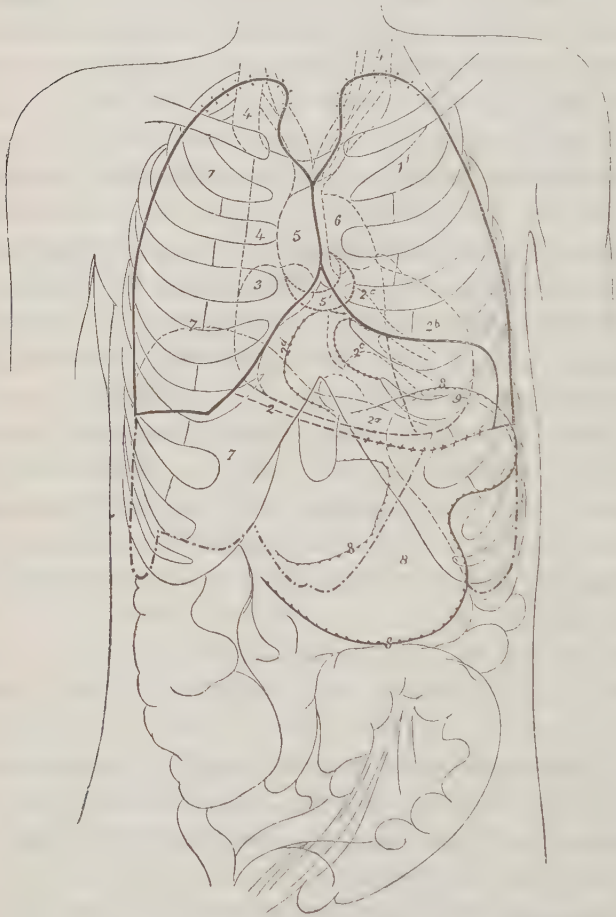
ENLARGEMENT OF THE HEART WITHOUT PERICARDIAL ADHESION.

When the heart is enlarged, its surface being free from attachments, the lungs on each side, the diaphragm below, and the costal cartilages and ribs in front, are displaced.

The whole volume of the heart descends, pushing before it, or being drawn down by, the central tendon of the diaphragm. They are not only the ventricles and auricles that are displaced, but all the great vessels springing from or merging in those

20.—ENLARGEMENT OF THE HEART, ESPECIALLY OF THE LEFT VENTRICLE.

JOHN ILLSTON, AGED 70, PATIENT OF DR. HUTCHINSON; MITRAL AND AORTIC REGURGITATION.



1. Right lung; 1'. Left lung; the summits of the lungs were not accurately ascertained.—2. The lower boundary of the pericardial sac; the left extremity is guessed at.—2*a*. Right ventricle; 2*b*. Left ventricle; 2*c*.-2*c*. Mitral valve.—2*d*.-2*d*. Tricuspid valve.—3. Right auricle.—4. Vena cava.—5. Aorta; 5. Aortic valves.—6. Pulmonary artery.—7. Liver.—8. Stomach.—9. Spleen, which was enlarged. (For general observations respecting this case see pp. 549-53. For

cavities are drawn down by them in their descent. Every valvular orifice, whether guarding the cavities or the great vessels, takes up a lower than normal position. (Diagrams 20 and 21.)

If both ventricles be alike enlarged they retain their usual relative position to each other; if the left ventricle only be enlarged, then the body of that ventricle to the left of the septum is very much increased. (Diagram 20.) If the right ventricle be disproportionably enlarged, then the ventricular septum is seated close to the left side of the heart. (Diagrams 14 and 15.)

Valves.—The precise bearings of the valves cannot be stated; they usually retain their positions relatively to each other, but they vary in situation according to the extent of the displacement. The important feature, in cases of enlarged heart free from adhesions, is, that the situation of the valves is lowered. In diagram 20, the mitral, tricuspid, and semilunar valves which are exposed are all lowered. In diagrams 14, 15, and 21, the lowering of the great vessels is very notable; and the position of the valves, their mutual bearing being known, may be readily inferred.

If the left ventricle be greatly enlarged, the mitral valve is situated unusually to the left, the attachments of its base are scarcely altered, but the fleshy columns and the tendinous webs and chords are stretched by the apex unusually to the left.

the appearances and symptoms during life, see diagram L. 12, which was taken from John Illston.)

Weight of Organs.—Right lung, 27 ounces; left lung, 20 ditto; the lungs were emphysematous, p. 405. Heart, 25 ounces; liver, 67 ditto; it contained many malignant growths. Spleen, 13½ ounces; pancreas, 13½ ditto; kidneys, each, 7½ ditto.

Lateral displacement, descent, and dilatation of the Lungs.—Enlargement of the heart displaces the lung. In diseases of the heart an unusual quantity of lung is generally required; the lung is consequently enlarged, and in very many cases becomes emphysematous; the diaphragm is of necessity abnormally low at the central tendon, and its lateral bulges always take up a correspondingly low position. The descent of the diaphragm necessarily draws down the lungs to an extent that more than makes up for their lateral displacement by the heart, and pushes down the liver on the right, and the stomach and spleen on the left side.

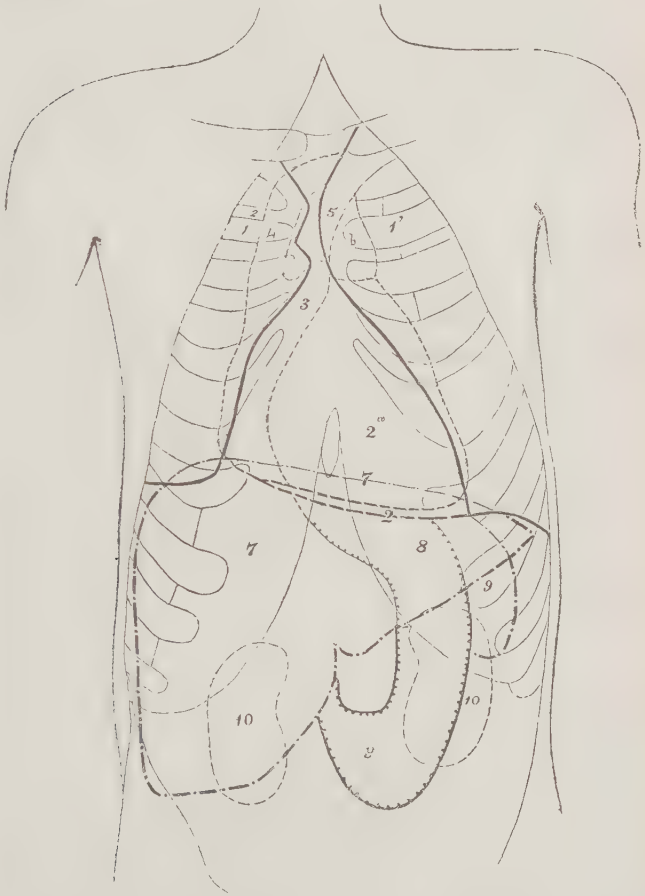
The inner margins of both lungs, on each side of the lower half of the sternum, are displaced. If the right cavities are very greatly enlarged, the displacement to the right of the right inner margin is considerable. If the left ventricle be the chief seat of enlargement, then the inner border of the left lung around the heart is greatly displaced to the left.

The point behind the sternum, at which the inner margins of the lungs separate from each other, is not usually pushed up; sometimes, in consequence of the general emphysematous inspiratory expansion of the lungs, it is even lowered. (Diagram 14.)

Heart's dulness and impulse.—The space of the heart's dulness is increased; this increase varies much. The extent of the heart's superficial dulness is by no means a measure of the extent of the heart's enlargement, as the lungs often overlap the heart to an unusual extent, owing to their emphysematous condition.

21.—ENLARGEMENT OF THE HEART.

HANNAH BROOKS, AGED 56, A BAWD; MITRAL REGURGITATION.

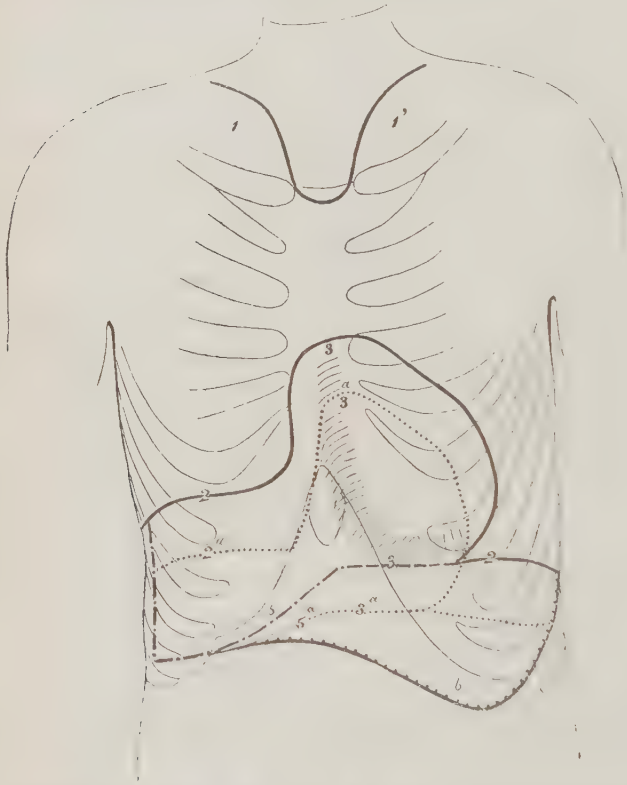


1. Right lung; 1'. Left lung.—2. Lower boundary of the pericardial sac.—2 *a*. Ventricles.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.—9. Spleen.—10–10. Kidneys.

Weight of Organs.—Right lung, 19½ ounces; left lung, 12½ ditto; heart, 12 ditto; liver, 38 ditto; spleen, 3 ditto; pancreas, 3 ditto; stomach, 2 ditto; kidneys, each, 4½ ditto.—Body spare; about 6 stone.

L 12.—ENLARGEMENT OF THE HEART, ESPECIALLY OF THE LEFT VENTRICLE.

John Illston, aged 70, Patient of Dr. Hutchinson; Mitral and Aortic Regurgitation. (See Diagram 20.)



Comparison with Health.—Left fourth, fifth, sixth, and seventh costal cartilages, and the fourth, fifth, and sixth ribs, project; also the left side of the lower half of the sternum, see the shading. The impulse at the apex is stronger, more extensive, and lower down than in health. By the impulse of the right ventricle the lower half of the sternum, and the adjoining costal cartilages, are heaved up slowly, pp. 555–6.

1.–1'. The apices of the lungs.—2.–2. The lower margins of the lungs, unusually low, especially the left; the lungs emphysematous, see p. 550.—2*a*. Descent of the lower margins of the lungs on a deep inspiration, considerable, p. 550.—3. Region of the heart's superficial dulness greatly increased to the right as well as to the left of the sternum; also to a very great extent downwards, so as to encroach

The lower edge of the space of the heart's dulness is invariably lowered, and the extent of this lowering is generally a good measure of the extent of the heart's increase. But this test is often fallacious; in females, the lower part of whose chest has been crushed in by tight lacing, the lower edges of the opposed sixth, seventh, eighth, and ninth costal cartilages, approach close to each other; the heart has not space to expand laterally, and its descent appears consequently, to be greater, relatively to the sternum and xyphoid cartilage, than in full-chested males. Compare the full-the chested males in diagrams 20 and L. 12 with the pinched-in, narrow-waisted females in diagrams 21 and L. 13.

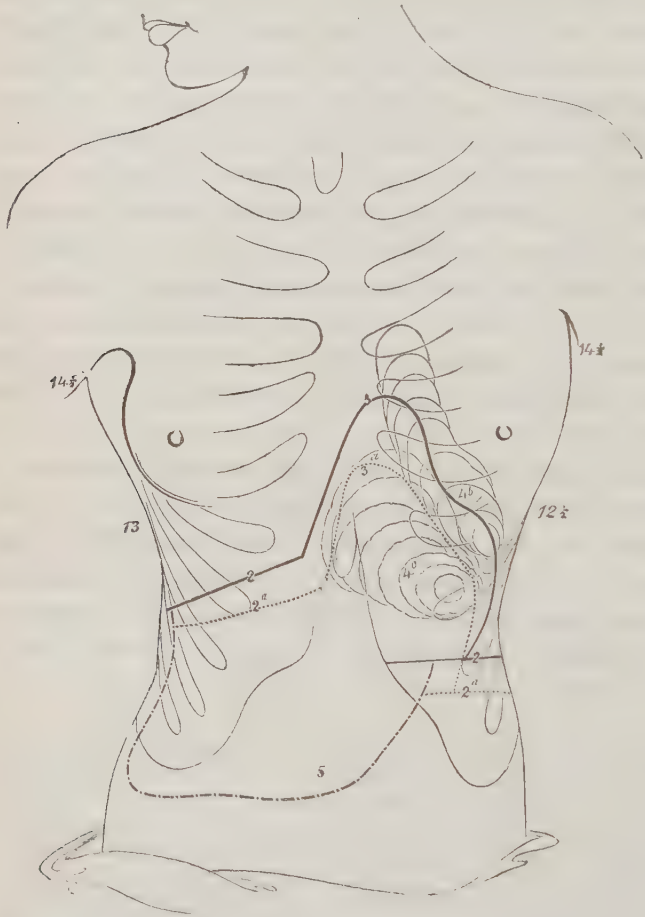
In emphysema the lungs do not descend so far in the stay-laced as in the full-chested, the descent of the diaphragm being interfered with; but in heart disease the enlarged viscus will make way for itself forcibly and push down the abdominal viscera, as it has no allowed lateral expansion.

on and displace the liver and stomach.—3 *a*. Region of the heart's superficial dulness not increased upwards, behind the upper half of the sternum; narrowed and lowered considerably by a deep inspiration —5. Liver.—6. Stomach, both of which are unusually low, owing to the enlargement of the heart and emphysematous enlargement of the lungs, displacing those organs.—5*a*. Liver lowered by a deep inspiration.

Physical signs.—Pulse rises, and falls back suddenly—tortuous, creeping, and visible to the eye. Systolic and diastolic bellows-noises over the upper part of the sternum, and above the sternum, unaccompanied by normal, sharp, second sound, excepting near the second costal cartilages; there the second sound of the pulmonic valves is audible. Near the apex, systolic, rasping noise, beginning with a sharp sound; diastolic, rasping, or bellows sound. Bellows noise heard along the whole left side of the spine; loudest below the scapula. Impulse at the apex, and over the left costal cartilages, extending over the whole region of dulness, strong; also, feebler over the lower part of the sternum.

L. 13.—ENLARGEMENT OF THE HEART.

MARY TOMLINSON, AGED 27; MITRAL AND AORTIC REGURGITATION.



2.–2. Lower margins of the lungs; that of the left lung remarkably low.—2 *a*. Lower margins of the lungs lowered by a deep inspiration.—3. Outlines of the heart's superficial dulness, wider to the right and left of the sternum, and much lower than in the healthy state.—3 *a*. Heart's superficial dulness lowered and narrowed by a deep inspiration.—4 *b*. Concentric curves: seat of impulse in the tranquil state; strongest over apex; felt from the second cartilage to the seventh rib; over the second intercostal space, a flapping, sharp, second impulse coincided

The actual lateral dimensions of the heart may be arrived at with tolerable accuracy by means of deep percussion over the lungs to each side of the sternum. The seat of the apex is readily ascertained by its thrusting impulse.

The extent and force of the impulse varies with the nature, extent, and seat of the heart's enlargement. If the left ventricle be enlarged, both walls and cavities being increased in due relative proportion, then the impulse at the apex and over the left ribs, close to their cartilaginous junction, is greatly increased both in force and extent. The impulse at the apex protrudes strongly and steadily.

If the right ventricle be enlarged, and its walls thickened, the lower half of the sternum, the xyphoid cartilage, and the left costal cartilages, from the third or fourth to the seventh, are heaved gently and steadily forwards, not by a pointed impulse, but by a diffused steady advance; the protruded walls usually fall back quickly towards the end of the systole.

with the diastole; no sternal impulse.—4 *c*. Concentric interrupted curves: seat of impulse on deep inspiration; the impulse of apex feebler, felt more to the right; the sternum and xyphoid cartilage slightly raised during systole. There was considerable projection of the left costal cartilages between the sternum and nipple, over the heart's region.

Physical signs.—Pulse, jerking, visible. Systolic and diastolic bellows noises over the upper part of the sternum, to the left of it under the left clavicle; no normal sharp second sound, except below the right clavicle. Over the lower part of the sternum and near the apex, through the open stethoscope, impulsive sound and rough bellows systolic noise; diastolic bellows noise indistinct. Through the closed stethoscope, no impulsive sounds; clear, almost musical, systolic and diastolic bellows noises. To the left of and below the apex, and between it and the spleen, the bellows noises are heard without impulsive sounds. Over the whole extent of the heart's dulness the systole commenced with a sharp impulsive shock; this was not heard beyond the region of dulness. All the heart's sounds were lowered on a deep inspiration, and when the patient was erect. Bellows noises heard over the whole dorsum.

The space of the heart's dulness is lowered and narrowed by a deep inspiration, to an extent quite as great as is permitted in the healthy state. (Diagrams L. 12 and 13.)

The seat of impulse is in like manner brought down ; (diagram L. 13 ;) the apex is often buried by the advancing lung, which now shields the walls of the chest from receiving its impulse.

The heart does not advance to the same extent with the lungs in the wake of the forward movement of the sternum and costal cartilages; the impulse behind those walls is diminished in force and extent as well as lowered. The xyphoid cartilage is not protruded so much during a deep inspiration as the sternum ; the heart advances as it is lowered, and the impulse at and below the xyphoid cartilage, over the sixth and seventh costal cartilages, and in the epigastrium is lowered and increased in strength.

Protrusion and separation of the Left Costal Cartilages.—The left costal cartilages and the ribs protrude to a greater extent than usual; (diagram L. 13 ;) they are separated farther from each other than those on the right side, the upper costal cartilages, being higher, and the inferior ribs, lower, than they commonly are.

If the right ventricle be greatly enlarged, the lower half of the sternum partakes of the protrusion.

If the left ventricle be the principal seat of enlargement, then the ribs are principally protruded towards the left margin of the heart.

Impulsive ringing noises.—If the left ventricle only be enlarged and hypertrophied, then the

impulse noises are often stronger, and more ringing than usual over the apex and the left boundary of the heart; sometimes there is a loud diastolic ring, due apparently to the sudden withdrawal of the apex from the costal walls. If the right ventricle be hypertrophied, the ringing impulsive noises, systolic and diastolic, are often heard over the sternum and costal cartilages

Impulsive noises dissected by the closed Stethoscope.—These ringing impulsive noises often obliterate the valvular sounds when the ear or the open stethoscope is applied. The closed stethoscope dissects the heart's sounds of these systolic noises, and leaves the valvular sounds smooth, pure, and unclouded by the abrupt shocks. Sometimes the very light application of the open stethoscope allows the unmodified valvular murmur to be heard, when a little pressure will replace it by the impulsive noises.

Mitral Regurgitation.—If regurgitation through the mitral valves generates the valvular murmur, then it is usually heard to the left of the sixth, seventh, and eighth dorsal vertebræ. If the aortic valves are normal, then the second sound often follows the mitral murmur; the valvular murmur becomes fainter over the higher dorsal vertebræ, and above the second or third is replaced by normal sounds.

Aortic narrowing and Regurgitation.—If aortic narrowing and regurgitation give birth to the valvular murmurs, the systolic noise is heard over the upper dorsal vertebræ, followed by a diastolic

valvular murmur instead of the normal second sound. If the mitral valve be not affected, the aortic murmur becomes fainter over the lower dorsal vertebræ.

PERICARDIAL ADHESIONS.

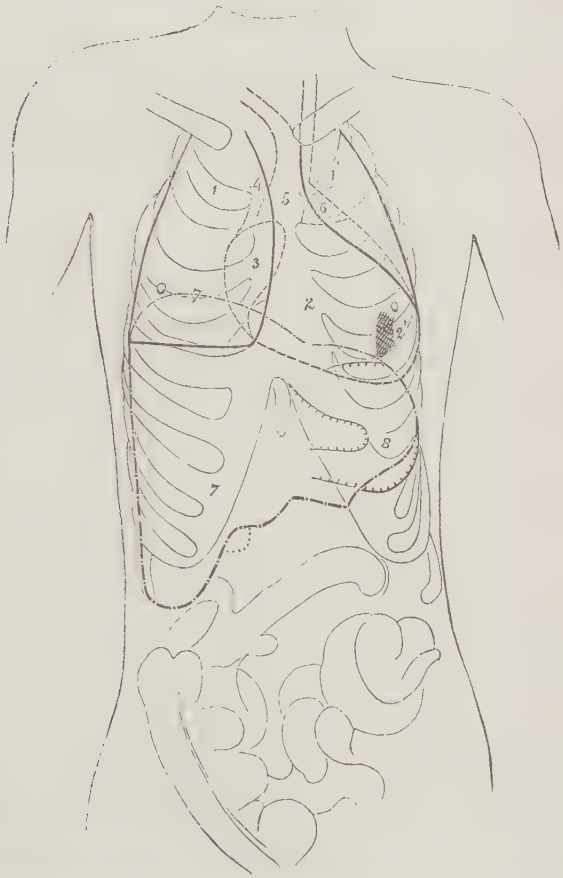
The mode in which pericardial adhesions are formed has been already noticed. (Pages 522, 526.) The adhesions vary greatly in firmness of tissue and in length of fibre; when they are partial they are usually longer than when they are universal. The apex is usually the seat of the partial adhesions; very often adhesions at the apex become stretched and attenuated, and at length give way.

Very often several pendulous, filamentous, tendinous bands hang from the apex of hearts that have no internal disease, but which display the white tendinous patches on their surface. The adhesions are usually formed, apparently, by clustered myriads of new tendinous fibres.

Universal adhesions.—The adhesions usually allow considerable motion to the heart; the length of the fibres over each part of the heart varies with the extent and strength of the usual to-and-fro movements of that part. Those over and near the apex are generally the longest; those at the base of the left ventricle are shorter than those towards the apex. The adhesions over the right are not so long as those over the left ventricle; they are longer near the auricular junction than over the body. Those over the right auricle are much shorter than those

22.—PATCH OF PERICARDIAL ADHESIONS NEAR THE APEX.

SARAH LACEY, AGED 20; RHEUMATIC PERICARDITIS, WITH PARTIAL PERICARDIAL ADHESIONS.



1. Right lung; 1'. Left lung.—2. Ventricles; 2'. Patch of pericardial adhesions; the attached adhered to the free pericardium, and the pleura lining the pericardium adhered to the costal pleura.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.

In this patient the impulse was rather strong in the neighbourhood of the apex, and was perceptible from the second to the sixth ribs. The sternum was gently and slightly heaved during systole.

There were faint smooth systolic, and fainter diastolic, friction sounds heard, on firm pressure, over the third costal cartilages; the sounds were normal on a light application of the stethoscope.

over the right ventricle; the auricular appendix is usually contracted by the fibrous adhesions.

The adhesions of the left auricle, the pulmonary artery, and the aorta, are generally much closer than those of the right auricle.

In a case of very recent universal adhesions the connecting material was of a glutinous consistence. In some specimens of recent pericarditis, where adhesions were being formed, the new membrane was villous and velvetty.

Adhesions with valvular disease.—If the pericardial adhesions are accompanied by valvular disease, the heart becomes necessarily enlarged. The largest heart that I have seen weighed two pounds, and was taken from the subject of diagram 24, in whom there was mitral aortic and tricuspid narrowing and regurgitation.

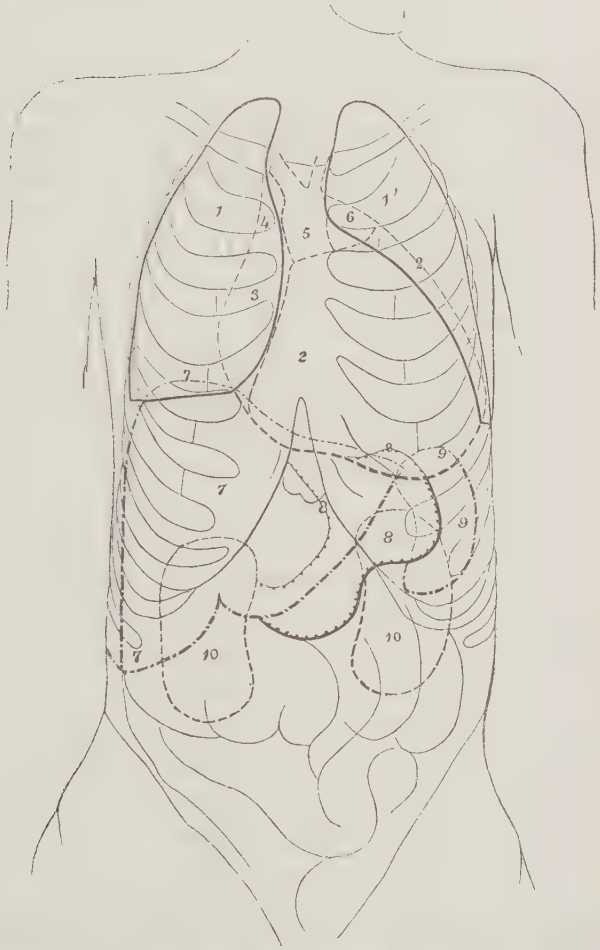
Adhesions without valvular disease.—I have seen four loosely-adherent hearts, of normal size, that were free from valvular disease; the persons from whom they were taken evinced no signs of heart disease, performed all the duties of active life, and died from causes totally unconnected with the heart affection.

It is a supported inference that loose pericardial adhesions may exist, if unaccompanied by valvular disease, without acting prejudicially on the heart's action on health or on life.

Strong adhesions.—If the adhesions be dense, strong, and contracted, and unaccompanied by valvular disease, they often gradually lessen the bulk of the heart's cavities, and impede their expansion. (See diagram 26, the subject of which had the most

23.—UNIVERSAL FIRM PLEURITIC ADHESIONS.

ELIZABETH HOOPER, AGED 17, PATIENT OF DR. HUTCHINSON; MITRAL REGURGITATION; HEART LARGE. (SEE DIAGRAM 11.)

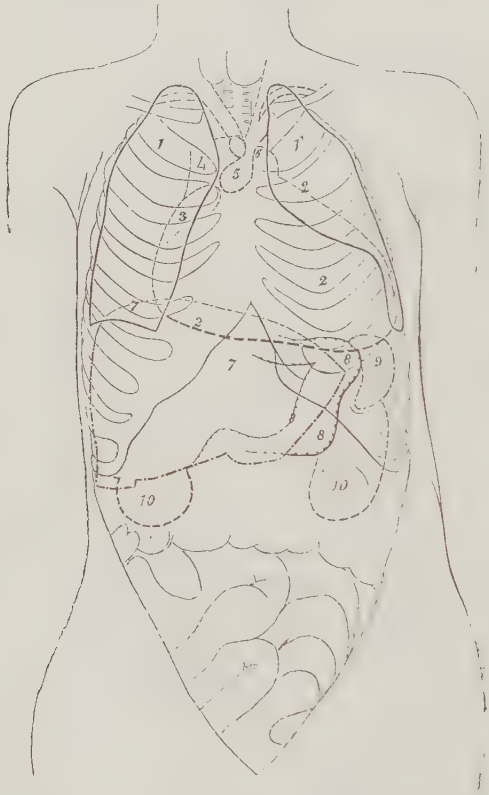


1. Right lung; 1'. Left lung; both lungs were adherent to the pericardium and diaphragm; the adhesions of the left lung were recent and soft.—2. Ventricles.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.—9. Spleen.—10.–10. Kidneys.

The adhesions were universal, very firm, and inseparable, save by dissection. The pericardium was much thickened; numerous small tubercles studded and thickened the mitral valve, through which regurgitation must have taken place during life; chiefly, I apprehend, because the columnæ carneæ could not contract.

24.—UNIVERSAL FIRM PERICARDIAL ADHESIONS.

MARY WEST, AGED 34; MITRAL, AORTIC, AND TRICUSPID NARROWING AND REGURGITATION; HEART VERY LARGE.



1. Right lung; 1'. Left lung.—2. Ventricles.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.—9. Spleen.—10.–10. Kidneys.

Weight of Organs.—Right lung, 20 ounces; left lung, 19 ditto; heart, 32 ditto; liver, 56 ditto; spleen, 6 ditto; pancreas, 4 ditto; kidneys, each, 6 ditto.

Heart's cavities enlarged; walls of ventricles thickened; mitral valve, cartilaginous, half an inch in diameter; aortic valves, calcareous, about half an inch ditto; tricuspid valve, firm, about three quarters of an inch ditto.

Physical signs.—Strong protruding impulse at the apex, between the sixth and seventh ribs. During the systole, the sternum and the left and right costal

distressing symptoms of heart disease.) In this case the heart was very small; the dense pericardial investment acted as an universal girdle.

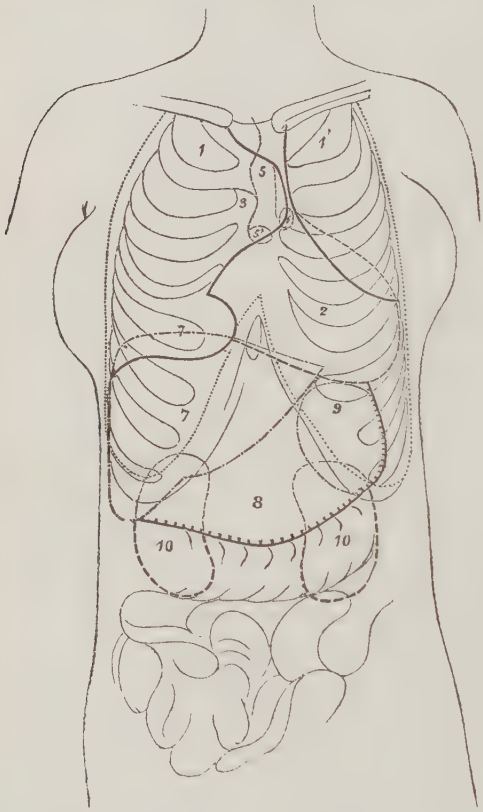
The shorter the adhesions the more prejudicial must they be. The costo-sternal walls are dragged backwards, as the ventricles contract, by a great portion of that force that ought to have been wholly expended in circulating the blood. The cavities are not allowed to empty themselves; their walls are not permitted to contract and exert their pressure in the natural manner. The efficient contraction of the columnæ carneæ will be prevented, and regurgitation will ensue in some cases where there is even no actual valvular disease.

Diagrams 22, 23, 24, 25, and L. 14, exhibit the position of the heart and the internal organs in cases of enlargement with pericardial adhesion; the cases are, to a certain extent, progressive. In diagram 22 the adhesion is partial; the ventricular septum is adherent near the apex, for the extent of an inch, to the free pericardium; the pleuritic surface of the pericardium, over the same point, is adherent to the costal pleura. The rest of the heart is free from adhesions; its pericardial surfaces are roughened by inflammatory new membranes; but as the movements of the heart upon the walls of the chest were prevented by the double

cartilages, over the right ventricle, became steadily depressed; immediately after the systole they advanced with a shock. Over the upper part of the sternum and near the great vessels, sawing systolic noise, purring tremor, and diastolic feeble bellows noise; over the third left costal cartilage, normal second sound; over the lower half of the sternum, feeble systolic bellows noise; over, below, and to the left of the apex, systolic and diastolic bellows murmurs. An impulsive shock or ring heard at the beginning and end of the systole.

25.—UNIVERSAL PERICARDIAL ADHESIONS.

ELIZABETH MARSHALL, AGED 22; UNIVERSAL PERICARDIAL ADHESIONS; MITRAL REGURGITATION.



1. Right lung; 1'. Left lung.—2. Ventricles.—3. Right auricle.—5. Aorta.—5'. Aortic valves.—6. Pulmonary artery, valves.—7. Liver.—8. Stomach.—9. Spleen.—10.-10.—Kidneys.

The dotted lines indicate the change of position on the outlines of the ribs and costal cartilages, caused by artificial inflation of the lungs. The movements of the ribs and cartilages are much greater on the right than on the left side.

Weight of Organs.—Right lung, 13 ounces; left lung, 11 ditto; heart, 25 ditto; liver, 32 ditto; pancreas, 4 ditto; kidneys, each, 6 ditto.

The ventricular cavities were enlarged; their walls and the mitral valve were

pericardio-pleural adhesions, there was only a feeble friction sound excited. In diagram 23 the adhesions were comparatively of recent formation; the margins of the valves were studded with numerous minute papillæ, of a tendinous consistence; but the mitral regurgitation, which was very marked, seemed to be chiefly due to the want of complete action in the columnæ carneæ. Diagram 24 exhibits a case of enormous heart-enlargement, of long standing, with mitral and tricuspid regurgitation. Diagram 25 was taken from a female, who had long been the subject of pericardial adhesions; the position of the valves, and the interference with the respiration of the left lung, is there shown.

Displacement of the Heart and its Valves, and of the Ribs and Internal Organs, by Pericardial Adhesions.—The right ventricle is usually enlarged as well as the left. In two cases the ventricular cavities were flattened; instead of the right ventricle taking a sweep half round the protruding left ventricle, it lay directly in front of it, the common septum being flattened instead of bulging. The ventricles expand upwards as well as downwards; way seems to be

thickened; the opening was of normal size; regurgitation would be permitted, from adhesions hindering the contraction of the columnæ carneæ, and from the thickened web; other valves were healthy.

Physical signs.—The impulse was very strong and jogging, shaking and heaving the whole chest. The apex protruded strongly; the lower half of the sternum advanced firmly at the beginning of the systole, and fell back gradually and firmly during its continuance. The lower end of the xyphoid cartilage fell in during the systole. Over the upper part of the sternum normal sounds, or a faint systolic murmur; second sounds normal. Over the ventricle near the apex, through the open stethoscope, loud successive impulsive noises, giving the effect of a jogging *canter*; through the closed stethoscope, the *canter* is inaudible; systolic, rather rough bellows murmur. Impulse irregular, 140 to 180.

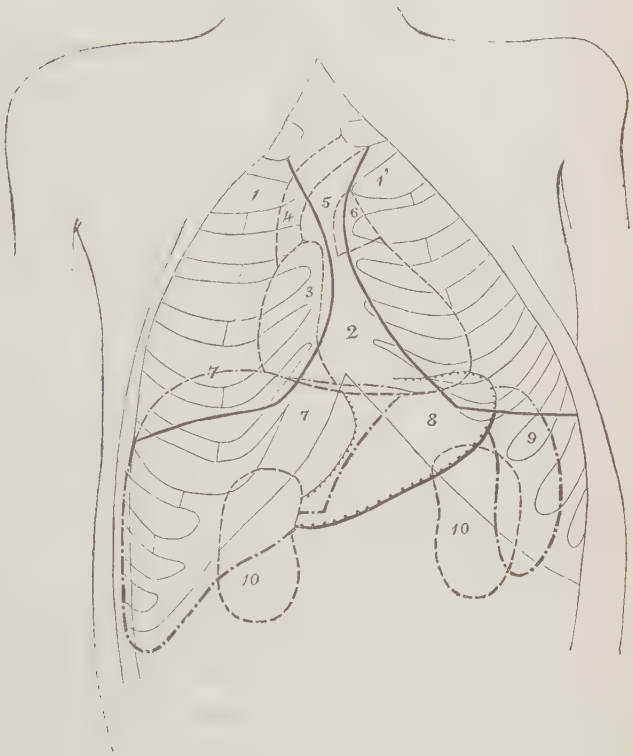
made for them above by the previous fluid distension. All the great vessels and the contracted appendix of the auricle are pushed upwards, riding on the top of the raised ventricles. The displacement of the sternal margin of the middle lobe of the right lung is considerable, somewhat more than it is in simple enlargement; but the left ventricle is very much more enlarged to the left than the right auricle and right ventricle are to the right. The apex in many cases goes quite over to the outer wall of the chest, pointing between the sixth and seventh or the seventh and eighth ribs, and entirely displacing the left lung, which is pushed backwards to an extent quite unknown in enlargement without adhesions. The mass of the ventricles is very considerably lowered; and as their downward displacement is chiefly on the left side, the left bulge and central tendon of the diaphragm, and the underlying spleen, stomach, and left lobe of the liver, are much further lowered than the right bulge of the diaphragm and the liver.

Where valvular disease exists, and the case is of long standing, (Diagrams 24 and 25,) the left bulge of the diaphragm and the liver are displaced to an extent nearly proportional to that of the left bulge.

Protrusion of the Ribs.—The lower two-thirds of the sternum and the attaching costal cartilages on each side of it, more especially the left, the xyphoid cartilage, and the sixth and seventh costal cartilages, are all pushed forwards; the whole of the lower left ribs are pushed outwards by the displacement of the apex. The adhesions of the heart lay hold of the costal walls as the heart enlarges, and draw

26.—UNIVERSAL PERICARDIAL ADHESIONS.

ELIZA BLIGHTON, AGED 19; UNIVERSAL STRONG GIRDLING PERICARDIAL ADHESIONS, PREVENTING THE EXPANSION OF THE CAVITIES; VALVES HEALTHY; HEART SMALL.



1. Right lung; 1'. Left lung.—2. Ventricles.—3. Right auricle.—4. Vena cava.—5. Aorta.—6. Pulmonary artery.—7. Liver.—8. Stomach.—9. Spleen.—10.-10. Kidneys.

Weight of Organs.—Lungs, each, 11 ounces; heart, 6½ ditto; liver, 37 ditto; spleen, 6 ditto; pancreas, 3 ditto; kidneys, each, 4 ditto.

Symptoms.—Heart's region of superficial dulness, impulse, and sounds, normal. Pulse very feeble; palpitation, dyspnœa, and anasarca; lips blue.

those cartilages outwards to the left; the lower edge of the conjoined sixth, seventh, eighth, and ninth left costal cartilages, to the side of the xyphoid cartilage, is much raised, and these cartilages and their attached ribs project to the left side. (Diagrams 22, 23, 24, and L. 14.)

Extent of the Heart's superficial dulness.—The extent of the heart's superficial dulness is very great; its margin rises as high as the third costal cartilage, descends below the middle of the xyphoid cartilage, is about a rib's breadth to the right of the sternum, and its left boundary is seated almost close upon the outer wall of the chest.

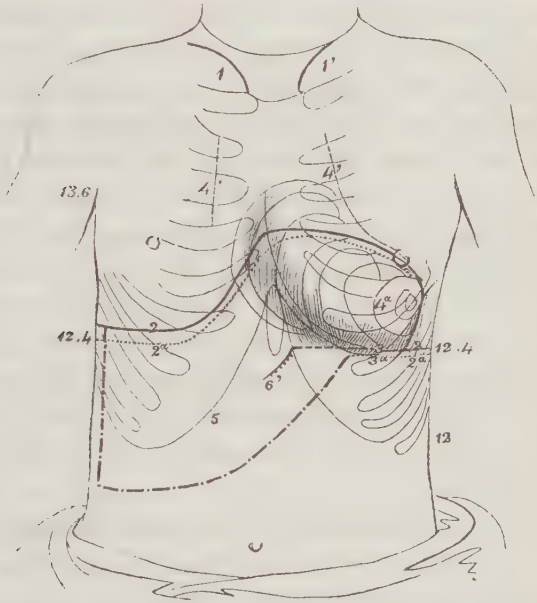
Respiration has little effect on the region of dulness or on the impulse.—A deep inspiration lowers the extent of the heart's dulness very little; the ribs on the entire left side have a more limited range of action than those on the right. (Diagrams 25 and L. 1.)

The impulse is felt over the whole region of præcordial dulness; that of the apex is extensive, strong, and thrusting, and is very far over to the left side; in one case the apex rose at the beginning, and fell back during the continuance of the systole. The sternum, costal cartilages, and xyphoid cartilage, are heaved forward firmly and steadily at the beginning of the systole; and during its continuance those parts fall back steadily and quickly, coinciding with the mode of systolic contraction of the right ventricle. (See experiment on an ass, p. 515.) In some cases the sternum and costal cartilages spring forward with a jerk during the diastole.

Lateral movement of the Ribs.—In diagram L. 14, and in another case just examined, the fifth and

L. 14.—PERICARDIAL ADHESIONS; ENLARGED HEART, WITH VALVULAR DISEASE.

ALICE MASSEY, AGED 15, PATIENT OF DR. J. C. WILLIAMS; DIAGNOSIS INFERRED FROM SYMPTOMS; RIGHT VENTRICLE LARGE.



1.–1'. Summit of the lungs.—2. Inferior margins of the lungs.—2*a*. Inferior margins of the lungs lowered by a deep inspiration; the lowering is greater on the right than on the left side.—3. Outlines of the heart's superficial dulness.—3*a*. Descent of the lower bound of the heart on a deep inspiration, very small.—4'. Outlines of the heart's deep-seated dulness.—4*a*. Concentric curves—indicate the extent of the heart's impulse.—5. Liver.—6. Stomach.

The shading expresses the extent of the protrusion of the sternum and ribs, due to the enlargement of the heart.

Symptoms.—Very considerable protrusion of the lower two-thirds of the sternum, and of the left third, fourth, fifth, and sixth ribs. Impulse of apex, very strong. The two lower thirds of the sternum firmly protrude during the systole; on the conclusion of the systole they fall suddenly back. The fifth and sixth ribs, over the ventricles, move from right to left during the systole.

Heart's Sounds.—Over the apex and the whole region of the heart's dulness, also to the left of and below the apex, and over the dorsum, a loud, smooth, musical, filing, systolic sound, is heard through the open stethoscope, accompanied by a feeble rumble; it is loudest near the apex. Over the stomach the valvular murmur has a peculiar hollow character; no second sound. Over the upper part of the sternum, faint valvular systolic noise; it is inaudible above it; no normal second sound.

sixth ribs and costal cartilages were drawn to the left during each systole, being dragged, apparently, after the heart during its movements from right to left by the adhesions.

Impulsive noises.—These sounds are usually, but not universally, very loud and ringing; they are composed of two, sometimes three, systolic impulses, and at last a diastolic shock; these sounds give the effect of cantering. In some cases there is a simple impulsive shock; and now and then a case is met with quite free from any impulsive noise. These noises quite obliterate any valvular sounds; but the application of the closed stethoscope removes them all, and exposes the valvular noises in unclouded clearness. The impulse noises are seldom so strong over the right ventricle as overthe left.

When the pericardial adhesions are long and loose, and when the heart is of normal size and free from valvular disease, the adhesions cannot give rise to any distinctive physical signs.

I have been drawn on to such an unreasonable length by the extent of my subject, by the amount of my materials, and by my want of command over words, that I cannot conclude this article in the manner I at first intended; neither can I, from want of space, now give in the appendix an analysis of the various diagrams and tabulated cases in my collection. I possess, including those engraved in this paper, 79 diagrams of the internal viscera, taken from the dead, and 85 from the living subject. I have likewise records in a tabulated form

of the relative position of the various viscera, as ascertained by percussion and auscultation, in 88 persons, of both sexes, and of various ages, occupations, and residences, in almost all of whom the heart and lungs were healthy. In 66 of these cases I have minute notices of the form of the surface, as indicative of the viscera underneath; of the respiratory sounds over the larynx, and over different parts of the chest in tranquil and in forced respiration; of the nature of the heart's sounds over the region of the heart's superficial dulness, the course of the great vessels, and the general surface of the chest; and of the seat of the heart's impulse. The results of the scrutiny of these materials are detailed in the preceding pages.

To the diagrams I refer with satisfaction and confidence; they have, for the most part, been constructed and reduced to their present dimensions with mechanical accuracy on Dr. Hodgkin's plans. The engravings are exact copies of the sketches furnished. To the engraver, Mr. Hart, is due the rare merit of not having made a single mistake in the whole series of wood cuts. The only engraving in which I am sensible of an error, and that is but slight, is diagram 6, which error is due not to the engraver, but to myself. The diagrams are reduced transcripts from nature; they do not merely illustrate this paper; they are illustrative of the works of Laennec and Dr. Forbes, Corvisart, Bouillaud, and Piorry; of those of Drs. C. J. Williams, Hope, Watson, Stokes, and Walshe, of M. Mailliot, and other authors.

If I have produced anything of worth in the preceding pages, I feel that it is due to having pursued, as nearly as my powers would permit, the steps of my first master in anatomy and surgery, Mr. Lizars, and of my master in pathology, Dr. Hodgkin.

APPENDIX.

Note to Page 308.—"The facts of the case were simply these. I at once perceived the importance of thy researches regarding the situation of the viscera in health and disease, when thou first mentionedst them to me, many months ago, and I announced them at a meeting of the Harveian Society, when my friend Dr. Edwin Harrison was relating his inquiries and observations regarding the situation of the liver, of which I was not previously aware, although it seems they had commenced even earlier than thine. When, at a subsequent period, thou relatedst to me thy multiplied observations, and the curious and definite results which thou hadst arrived, I was very desirous to impart them at for the benefit of the students of St. Thomas's Hospital, in the restoration of which school I had been solicited to take a part; and having obtained from thee the permission and means to enable me to do so, I was further desirous that the school might have the credit of being the first publicly to divulge thy new method, and the results to which it had led. For this purpose I introduced the subject at one of the *soireés* given in the course of last season. I had many large diagrams prepared and exhibited, and briefly exposed the principal pathological and anatomical points which thy observations had either originated or confirmed, pointing out at the same time the modification in the form of the chest discovered and described by Dr. Harrison, together with some comments on the mode in which its hepatic bulge is produced.

"When mentioning the fact which thou hast pointed out, that the inferior margin of the liver makes a less descent than the diaphragm in expiration, I endeavoured to connect this discovery with Alexander Shaw's observations on the hepatic circulation, as given to the British Association, and published in the *Medical Gazette,* and I think I gave the explanation which may thus be rendered of the influence of riding on horseback, and some other exercises, in stimulating the functions of the liver."—*Extract of a Letter from Dr. Hodgkin to F. Sibson.*

Note to Page 348.—Some years ago Mr. Waterton performed in Nottingham some experiments with the wourali poison on an ass. He inserted the poison into the fleshy part of the animal's fore leg; in twenty minutes the ass appeared to be dead. The heart still beat. Artificial breathing was kept up for *seven hours and a quarter,* during the whole of which time the heart continued to beat, though the ass was apparently lifeless; at length the nostrils dilated, he breathed, he kicked, opened his eyes, and became sensible, in short he was again alive.

Mr. Waterton's object was to prove that man may have the life of his nervous system perfectly suspended by the wourali and yet recover. In hydrophobia the nervous system is morbidly overactive, death is inevitable; it is anticipated that after palsying the nervous system for a time with the wourali, the patient will awake to consciousness free from disease.

Note to Page 443.—"I observe thou hast noticed my opinion regarding pneumonia; but I think it is liable to be misunderstood when it states that complete pneumonia is not recovered from. My opinion and statement have been that the most plastic form of pneumonia obliterates the cells and leads to contraction; that the opposite form, or white hepatization, from the commencement is non-plastic, breaks down if the patient survived long enough; but that the intermediate form, which is the most frequent, admits of restoration.

"The three forms are all positively pneumonia. The ultimate results of the first form have, I think, been overlooked, or at least never clearly described, with the exception of the notice of them in my second volume."—*Extract of a Letter from Dr. Hodgkin to F. Sibson.*.

ARTICLE V.

A CASE OF ANEURYSM OF THE POPLITEAL AND INGUINAL ARTERIES, ON THE SAME SIDE, SUCCESSFULLY TREATED BY LIGATURE OF THE EXTERNAL ILIAC; WITH A FEW REMARKS ON THE DILATING FORCES OF ANEURYSMAL TUMOURS, AND ON THE MODE OF APPLYING PRESSURE TO THEM.

BY J. H. JAMES, ESQ.,

Surgeon to the Devon and Exeter Hospital, and Consulting Surgeon to the Exeter Dispensary.

I BELIEVE there are but few cases on record of aneurysms forming simultaneously in the ham and groin, which have been operated on. I am therefore induced to communicate the following, which, on many accounts, may prove interesting :—

John Downing, by occupation a quay porter, was admitted a patient of the Devon and Exeter Hospital July 10th, 1843. His appearance was sallow and unhealthy. In the month of January he had severe tetanus, from a lacerated wound of the thumb.

On his admission, he had a tumour of the size of a large orange, in the left ham, which, as he

stated, had not been noticed until two months previously. It contained only fluid blood, and pulsated strongly. The course of the artery was carefully examined above, and nothing wrong detected. There was no evidence of any other disease of the circulating system.

The tumour rapidly increased, and the 23rd of July was fixed for the performance of the usual operation in the thigh; but on the 21st, on again examining the course of the artery, I perceived a small aneurysm in the groin. As I was then on the point of going to Leeds, it was thought advisable to postpone the operation till my return.

August 16th.—The aneurysm in the groin had attained the size of a large pigeon's egg; that in the ham had much increased, and was very painful; both were filled with fluid blood.

I now tied the external iliac in the mode recommended by Sir Astley Cooper, which, in *small* aneurysms in the groin, I believe, is the preferable mode; but in adopting this plan, I found it necessary to divide the aponeurosis of the external oblique at right angles with the external wound, for the space of two-thirds of an inch, in order to obtain room to manipulate freely; and I may mention, that in another case of ligature of the external iliac, which occurred at this hospital, the same proceeding was employed with much advantage. No difficulty was experienced in detaching the internal oblique, or transversalis, or the bag of the peritoneum, with the fingers and the handle of the knife; and the artery was readily felt pulsating at the bottom of the wound.

Authors on surgery direct that the sheath of the vessels should be carefully divided. I have never seen this possible in these cases; for although all considerable vessels which spring be tied, (two were in the present case,) enough blood has been poured fourth to obscure the bottom of the wound entirely As I could not perforate the sheath of the vessels with my nail, an aneurysmal needle was selected, with a narrow but not cutting edge; and being placed within the nail itself, was insinuated on the inside of the artery, and gradually worked through to the outer side. This carried no ligature; but through the opening thus made Weiss's needle was subsequently passed without difficulty, and the artery tied with the ligature so conveyed; all pulsation ceased at once.

It would be both unnecessary and wearisome to detail the daily occurrences of this case. I shall briefly state, that on the following day both tumours were solid; there was no pulsation in the ham, but a slight tremulous motion in the groin.

From this period the pulsation increased in the groin, and after a few days retnrned, though more feebly, in the ham. It soon ceased altogether in the latter situation, and is now become very feeble in the groin also.

The tumour in the ham is reduced to less than one-fourth of its original size. That in the groin is not larger than a large filbert; both feel solid. The patient is up, and able to put his foot to the ground.

Some accidents occurred in the course of the treatment, which it is necessary to mention.

August 23rd.—Diarrhœa came on, which, though checked by astringents, had a great tendency to recur.

August 25th.—A phlyctena formed on the sole of the foot.

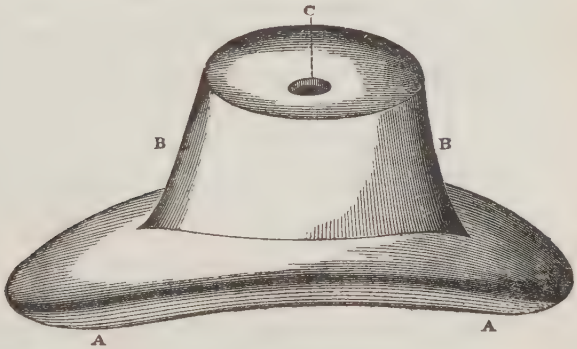
September 1st.—The ligature, which was never drawn, came away in the dressing.

September 3rd.—At 1 A. M. I was sent for, on account of a sudden and considerable hæmorrhage; the blood was arterial, but did not flow in jets. At this time there existed no pulsation in the course of the external iliac above the wound, but considerable in the tumour in the groin; it was therefore concluded that the hæmorrhage proceeded from the lower orifice. A compress on the wound arrested it for a time, and a mode of pressure on the aneurysmal tumour, hereafter to be described, was employed to prevent its recurrence, and with success. There was no further hæmorrhage.

September 4th.—Another phlyctena now appeared; under this, as well as the preceding one, superficial sloughs formed. The lower part of the leg, at the same time, became œdematous, but was constantly warm. I assisted the return of the venous blood by raising the lower end of the bed on blocks, and the superficial sloughs were covered with flour simply. They did not spread under this treatment, and the œdema disappeared.

With the risk of exciting a return of hæmorrhage on one hand, and the fear of sphacelus of the foot on the other, the question of diet was somewhat difficult; but on the whole it appeared better to give a generous diet, as the pulse was feeble and

countenance sunk; and it answered well. At this moment I think it may be safely stated that all the risks have been surmounted, and that there is no probability of any interruption to his perfect recovery.



A A. The cast adapted to the surface of the groin.
B B. The reservoir subsequently raised over the centre, into which the mercury is poured through the aperture C., which may be closed with a stopper.

Mode of applying Pressure by Mercury.—I may now briefly describe the mode which I employed to produce pressure in the groin. It is well known that pressure has been effected, in some cases, by the intervention of a compress, formed by a cast of plaster of Paris, and moulded on the tumour, the perfect adaptation and firmness of which are well adapted to the purpose intended. But as it is highly important to avoid any circular pressure in these cases, it struck me that by placing a weight over the centre of the tumour, I might advantageously accomplish this object. The mode in which it was effected, is as follows:—

A small cast having been made, adapted to the

groin, I had a reservoir also built up of plaster over its centre, with a hole at the top, into which I could pour as much quicksilver as might produce the requisite effect. A sketch of this apparatus is given in the preceding page. The weight of quicksilver has amounted to $13\frac{1}{2}$ ounces. It was almost constantly worn until he got up, excepting when some changes in position were necessary; but these were few. I more particularly mention this contrivance, because it is not improbable that it may be made to serve in other cases where continued pressure is desirable, and interruption to the venous circulation should be avoided.

The mechanical contrivances which are called in in aid of our profession are by some thought lightly of, yet many have been the result of much careful thought, and at all events are, in numerous cases, of great value in surgery. This leads me to mention another plan, which I have adopted in this as in other instances for some time past; I allude to *the mode of passing sutures.*

There are few surgeons who have not felt the inconvenience of pushing an ordinary curved needle through tough integuments. The holdfast does not give sufficient power. The method I have employed is as follows: taking an instrument similar to that which is used for passing ligatures under nævi, but with edges cutting near the point, I push it through the edges of the wound. The ligature is then passed through the eye and instantly brought back; it is the work of an instant, less painful to the patient by far, and much more definite in its application than the old method. I passed three sutures in this way

through the wound in the present case. The needle part of the instrument, if separate and made to screw into a handle, is rendered easily portable in an ordinary case.*

While on the subject of aneurysm I shall take the opportunity of proposing, with great deference, to those who take an interest in the pathology of these diseases, the following opinions which I have long entertained, but the accuracy of which must be determined by persons more competent in physics than myself.

It is well known that a perpendicular column of fluid, gravitating on any receptacle filled with fluid, exerts on every portion of the sides the same degree of pressure, as if the full weight of that column were exerted on that portion, so that its effect is multiplied by the extent of surface on which it acts; and in this way enormous weights may be raised by the gravitation of a few ounces of liquid. This singular phenomenon has been called the hydrostatic paradox.

Now it appears to me that the walls of an aneurysm are in an analogous predicament, and that if the body is upright, a pressure will be exerted at all times, in a degree varying from the full to the empty state of the artery during its systole and diastole; but much more especially and in all postures, that the impulse of the heart will represent a force similar in operation to the gravitation of an equivalent column of fluid. If

* The length of the handle is about three inches and a half, the needle part about two inches and a half.

this hypothesis be correct, we should expect that the larger the aneurysm became, the more powerful would be the sum of the dilatation, increasing as the square of the surface acted upon; and that such is the case, the phenomena of aneurysms show, as far as I can judge. At the same time that the aneurysmal tumour increases, its pressure obstructs the flow of blood through the trunk behind it. But I hold it to be a law of the circulating system, that the trunk will enlarge in proportion to the demand for supply by the extreme vessels; when, therefore, this is diminished by the obstruction alluded to, the trunk above will assume a larger calibre, though fruitlessly, and the operation of the hydrostatic force be thereby also increased.

Where the contents remain fluid, there is no limit to the action of these causes; but as in most aneurysms fibrine is deposited and coagula formed, the operation of the principle above stated will be confined to the proportion of the contents remaining fluid; whence arises, probably, one great use of this natural effort at curing by consolidation. If this theory be true, then it may be predicated of aneurysms that they will rapidly increase, and the reverse, in proportion as less or more of the contents become solid; we shall also see why, when the contents have become solid, after a ligature has been applied, the recurrent stream is only capable of acting on so small an area, as well as with so much less power; and why, when a ligature has been applied in Brasdor's method, the demand being no longer capable of being communicated through the principal trunk, which is abandoned, the efforts of the heart cease to be exerted on the tumour.

In advancing these opinions, I have argued as if there were only one opening in the aneurysmal sac, in which case I apprehend the conditions here stated would be strictly correct; but the continuous channel of the artery below, as long as it is allowed to remain open, must be estimated as taking off the pressure either altogether or to a certain extent. I may express my persuasion that it would be found, on enquiry, that in proportion as the outflowing stream is narrowed by the progress of the aneurysm, the hydrostatic law alluded to, will operate more and more strongly. I have long ceased to pursue the study of physics, and from this cause, as well as from want of leisure, am very incapable of prosecuting the subject to a certain conclusion. If it should be deemed of sufficient importance for others more capable, and more conversant in these sciences, to consider it, I must leave it to them to determine its truth or fallacy; but I hope I shall not have erred in suggesting what at present is an untried theory, since its application, if in any degree well-founded, may be important.

Exeter, February 4, 1844.

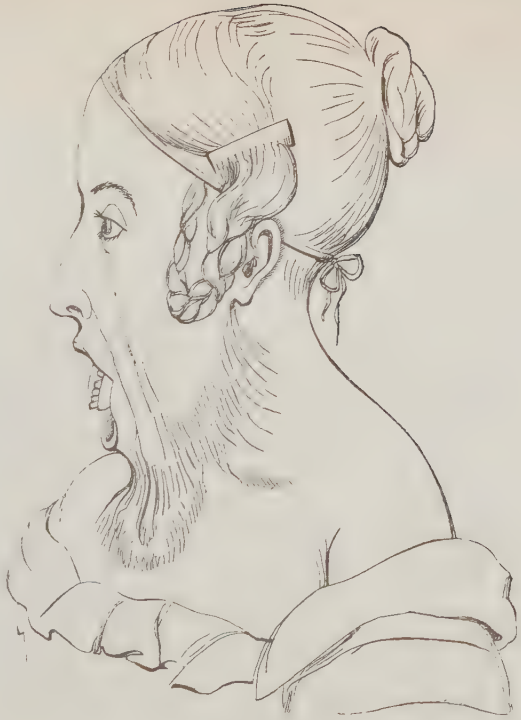


FIGURE 1.

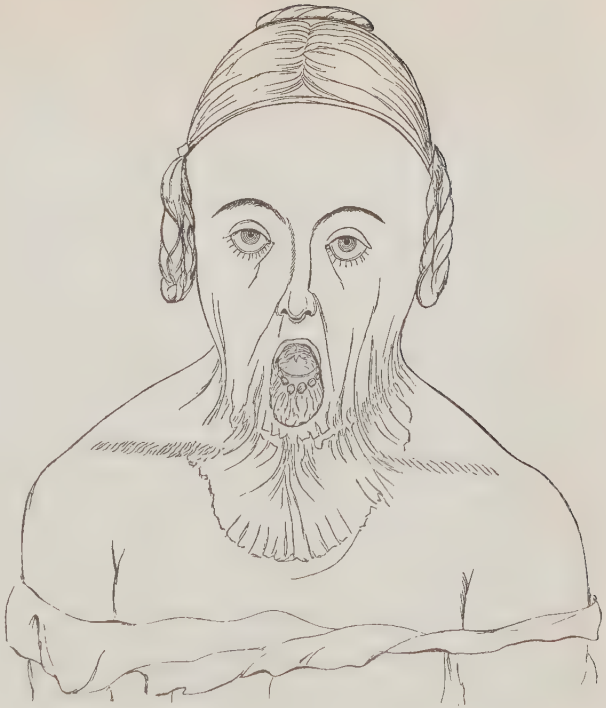


FIGURE 2.

CASE OF CONTRACTED CICATRIX

AFTER A BURN,

RELIEVED BY INTERPOSITION OF SOUND SKIN.

BY H. D. CARDEN, ESQ.,

Surgeon to the Worcester Infirmary.

Mary Ann Barnett, aged 14, was admitted into the Worcester Infirmary, September 9th, 1839. The burn which occasioned the present deformity occurred seven years since. Figures No. 1 and 2, taken on her admission, give a fair idea of her appearance. The movements of the head are greatly restricted, the mouth remains permanently open, the tongue protrudes, the lower incisors project horizontally, and there is constant salivation. On attempting to raise the head, the eyelids are drawn considerably downwards. The patient, as well as her friends, being most anxious to have something done for her relief, a consultation was held upon the case, when it was admitted that the experience of modern surgical authorities was not in favour of such attempts; and that where excision

of the cicatrix had been practised the deformity had generally been increased rather than otherwise. Under these circumstances a new mode of proceeding was suggested, which, on explanation, was sanctioned by my colleagues, and performed November 1st, 1839, in the presence of, and assisted by, Messrs. Sheppard and Pierpoint, Surgeons to the Hospital, Mr. Cole, House Surgeon, and the pupils. A contrivance for keeping the head erect during the after treatment of the case had previously been provided.

The patient being placed on a well-cushioned table, with her head and shoulders somewhat elevated, I commenced the operation by carefully gathering up the cicatrix from below the left ear to the top of the sternum, between the fingers and thumb of the left hand, which enabled me to transfix and divide the whole of that side at a stroke; the same was repeated on the right side, and a short cut over the top of the sternum connected the two incisions. In this manner the whole transverse extent of the cicatrix was rapidly divided, the wound terminating in sound skin on each side. The chin was then drawn upwards by an assistant, and every tense band of cicatrix successively divided by repeated strokes of the scalpel, until the head was released into nearly its natural position. By this mode of dissection, although nothing had been removed, the hiatus produced was very great, and extended from above the chin and edge of the lower jaw to below the upper border of the sternum, exposing the greater part of both sterno-mastoid muscles, and external jugular and thyroid veins, the

latter being particularly large and prominent. The quantity of blood lost was very trifling, scarcely requiring the torsion forceps. As soon as all bleeding had ceased, I proceeded to select a portion of sound skin on each side, about three inches long and two and a half wide; these were raised and detached, except at their junction with the outer edges of the wound, and brought together across the centre of the neck, and there united by hare-lip needles. The side wounds left by the flaps were then brought together, (figure 3,) and the exposed parts covered with lint. The flaps were carefully supported by adhesive plaster, leaving apertures for

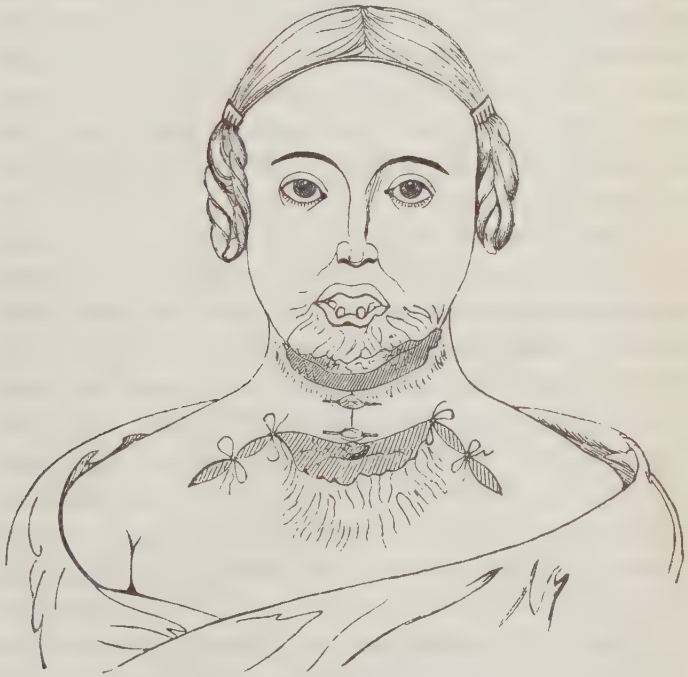


FIGURE 3.

the points of the needles, and the whole of the wound and surrounding integuments were well supported by long plasters and bandages.

She bore the operation, which was severe and necessarily protracted, with great fortitude and without fainting, and went on favourably. The needles were withdrawn two days after the operation; the dressings were not removed until the sixth day, when the flaps were found to have retained their position; but the upper border of each, being composed of old cicatrix, had perished, diminishing the breadth of each to less than two inches. The complete healing of the wound occupied nearly twelve months, during which time various contrivances, in addition to that first used, were had recourse to for keeping the head in the erect position; but the bodily and mental suffering was so great, each time the wound was dressed, from these repeated stretchings, that I discontinued them altogether.

She was made out-patient in May, 1840, and in November following she presented the following appearances:—wound healed, position and movements of the head greatly improved, can close the mouth, retain the saliva, and articulate distinctly; teeth regaining their natural position. A narrow cord has sprung up between the flaps, which threatens to draw down the centre of the lower lip, and also to prevent the further expansion of the flaps which has hitherto been steadily going on and forming the most satisfactory feature of the case.

I passed a curved bistoury under this and divided it, enjoining pressure and further extension; but

from that time she avoided attendance at the hospital and neglected all directions, and I saw no more of her until October 23rd, 1843, when I sent for her and made the sketch, figure 4. She has become stout in person, has enjoyed good health, and is very grateful for the improvement gained. The teeth are quite upright, and I regret that one was extracted before the operation, although at that time it appeared hopelessly displaced. The flaps now measure three inches on the right side, and two inches and three quarters on the left, from above downwards; but there is an increased contraction

FIGURE 4.

in the central cord, which is strongly marked in the sketch. This she has consented to have divided and separated from the flaps, which may then, I trust, be permanently united, and her appearance considerably improved.

Four years having elapsed since the operation, a fair estimate may now be formed of its merits. I should, however, have considered it premature to submit it to the notice of the profession until further trials in my own practice had rendered the subject more complete, had not my attention been called to an interesting paper by Dr. Mütter, of Philadelphia, in the *American Journal of Medical Science,* the result of whose operations, undertaken at a subsequent period to that above detailed, appears fully to establish the value of the flap method, or, as Dr. Mütter calls it, the "auto-plastic operation," in these very distressing deformities.

Dr. Mütter's operation consists in completely dividing and releasing the cicatrix, and if necessary, one or both tendons of the sterno-mastoid muscles, and then filling the gap so produced by a single flap of sound skin, of about six inches long by five inches and a half wide, taken from the shoulder, of sufficient size to completely close the wound and unite by the first intention. It will be seen that my operation is a similar adoption of the Taliacotian method, with this difference, that I have employed two flaps instead of one, and have not attempted completely to fill the gap produced by releasing the cicatrix, which would have required a much larger portion of skin than I made use of.

It is curious that, in reflecting on the operation, both Dr. Mütter and myself have proposed modifications, which would be similar to the operation practised by each other. Dr. Mütter states towards the conclusion of his paper, "in very extensive cicatrices of the neck it may be well to modify the operation, so as to take a flap from each side, by which means we shall avoid the risk of a single flap." In my notes on my own case I find the following, dated November, 1840: "In a future operation I should endeavour to procure more complete union between the flaps in the centre, or (which perhaps would be better) should, if possible, cover the whole hiatus with a single flap." Upon this point I am disposed to prefer the operation of Dr. Mütter, comparing the result of his four cases with that of my single experiment, although the quantity of sound skin removed in his cases is so considerable as not to be without risk to its vitality, and the further inconvenience, which may be gathered from the candid report of his cases, of an open wound over the acromion for a considerable length of time. In future I should avoid the inconvenience experienced in my case, and which is very apparent on looking at figure 4, of a cord springing up in the centre, by making the flap or flaps if taken from each side sufficiently long to reach across the neck.

In the after treatment it will be seen that all means for extending the neck were abandoned, the daily application of them being so exceedingly painful and distressing to the patient, that no consideration of future advantage would reconcile her to

it; and from what I have seen of the application of such means, in this and other cases, I should be disposed to leave them out of my calculations in future; at all events, until after the healing of the wound.

I had formed this opinion before reading a paper by Mr. James, of Exeter, read before the meeting of the Provincial Medical and Surgical Association, at Leeds, in 1843, in which he advocates a modification of Earle's operation, and relies for success upon the application of a "screw collar," "which is applied as soon as suppuration is established, and continued for some months after cicatrization is complete." The general adoption of Mr. James's plan at the Exeter Hospital speaks much in its favour; but unless the screw collar in use at Exeter is far more humane than any of the contrivances I could devise, I would never in future be persuaded to divide, much less excise an extensive cicatrix in the neck, in itself no trifling proceeding, with the prospect of following up the case by the daily application of such an instrument. The state of the patient at the end of two years, after the disuse of the collar, would perhaps afford a fair criterion of the success of the operation.

The above case is not brought forward merely for the purpose of claiming the credit of priority over Dr. Mütter in the application of a well-known principle to cases of this description, which is a matter of very little consequence; nor as a case of complete success, if by such is meant the entire removal of all deformity; but it presents sufficient points of interest to the practical surgeon to prevent

my withholding the publication of it. It proves, as far as a single experiment can, that sound skin placed in the situation of a previously contracting cicatrix, not only does not itself contract, but that it prevents the disposition to contraction; and, further, that it has a capability for expansion when united to and acted upon by a cicatrix on each side of it. This fact will enable us to relieve many similar deformities of the plicated flexures of the limbs and trunk, with a comparatively narrow strip of sound skin.

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Wright, T. G., M.D., Visiting Physician to the West Riding Lunatic Asylum, Wakefield.
Wright, Warner, M.D., Consulting Physician to the Norfolk and Norwich Hospital, Norwich.
Wyman, ——, Esq., Surgeon, Alcester, Warwickshire.
Wynne, Rice, Esq., Surgeon, Shrewsbury.
Wynter, Thomas, Esq., Surgeon, King's Tamerton, Plymouth.

Y.

Yarde, Edward, Esq., Surgeon, Crediton, Devon.
Yate, Frederick, Esq , Surgeon, Godalming, Surrey.
Yonge, John Francis Dale, M.D., Coblentz, Germany.
Young, Edward William, Esq., Surgeon, Henley-upon-Thames.
Young, Edward, M.D., Winslow, Bucks.
Young, James, Esq., Surgeon, Wells, Norfolk.

NAMES OF MEMBERS RECEIVED TOO LATE TO BE INSERTED IN THEIR PROPER PLACES, OMISSIONS, AND CORRECTIONS.

Addison, William, Esq., Surgeon, Soham, Cambridgeshire, instead of Addison, ——, Esq.
Barker, William D., M.D., removed from Honiton to Preston, near Weymouth, Dorsetshire.
Beckett, Charles Wiliam, Esq., Surgeon, Sheffield.
Blount, John Hillier, Esq., removed from Cheltenham to Birmingham.
Buchannan, Robert, M.D., Pontefract, Yorkshire.
Burnham, Robert, Esq., Surgeon, Holme on Spalding Moor, Market Weighton, Yorkshire.
Cole, J. C., Esq., Surgeon, Haddenham, to be erased from the list.
Gordon, Taylor, M.D., Physician to H.R.H. the Duke of Cambridge, and formerly to his late Majesty William IV., Southsea, Hants.
Graham, Edward Smith, M.D., 4th Light Dragoons, removed from Exeter to Ipswich.
Hobson, Smith, Esq., Surgeon, removed from Northampton to Cranbourne, Dorsetshire.
Kerswill, Robert, Esq., Surgeon, St. Germains, Cornwall.

As it is scarcely possible to avoid errors in printing so numerous a list of Members, the Secretary is anxious, wherever they are committed, that they may be amended; and will therefore feel obliged if those Members whose names are not rightly inserted, or whose Christian names are omitted, will send the requisite Corrections.

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ERRATA.

In the "Retrospective Address on Surgery," p. 173, last line, for "twelve *months*," read "twelve *years*."

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THE FOLLOWING ARE

THE PRINCIPAL OBJECTS

TO WHICH THE ATTENTION OF THE

PROVINCIAL

MEDICAL AND SURGICAL ASSOCIATION

IS DIRECTED.

1st.—Collection of useful information, whether speculative or practical, through Original Essays, or Reports of Provincial Hospitals, Infirmaries, or Dispensaries, or of private practice.

2nd.—Increase of knowledge of the Medical Topography of England, through statistical, meteorological, geological, and botanical inquiries.

3rd.—Investigations of the modifications of Endemic and Epidemic Diseases, in different situations, and at various periods, so as to trace, so far as the present imperfect state of the art will permit, their connexions with peculiarities of soil or climate, or with the localities, habits, and occupations of the people.

4th.—Advancement of Medico-legal Science, through succinct reports of whatever cases may occur in Provincial Courts of Judicature.

5th.—Maintenance of the honour and respectability of the Profession, generally, in the Provinces, by promoting friendly intercourse and free communication of its Members; and by establishing among them the harmony and good feeling which ought ever to characterise a liberal profession.

THE LAWS

OF THE

PROVINCIAL

MEDICAL AND SURGICAL ASSOCIATION.

1st.—That a Provincial Medical and Surgical Association be formed.

2nd.—That the Association be managed by a President, a President of the Council, Secretary or Secretaries, and Council.

3rd.—That the several Officers be appointed annually, by a General Meeting of Members convened for that purpose, at whichever of the principal towns may be appointed; the place of such Meeting being prospectively notified each year.

4th.—That at this Meeting shall be presented a Report, prepared by the Secretary or Secretaries, of the general state of the Association, its proceedings, and pecuniary accounts; the Report to be afterwards printed, and a copy supplied to every Member.

5th.—That at this Meeting one of the Members shall be appointed to give, at the next Annual Meeting, an account of the state or progress of Medical Science during the last year; or an Oration on some subject connected with Medical Science; or a Biographical Memoir of some eminent cultivator of Medical Science, who may have resided in the Provinces.

PRESIDENT OF THE ASSOCIATION.

6th.—That the office of President be honorary, and conferred on some senior Physician or Surgeon of eminence, resident in any of the provincial towns comprised in the circle of the Association.

OFFICERS AND COUNCIL.

7th.—That the Secretary or Secretaries be resident in Worcester, the place of publication, the duties being to attend to the printing of the *Transactions*, and to correct the press; to be present at the meetings of the Council, and to keep the minutes thereof; to correspond with the Members of the Association; and to receive and submit to the Council all papers transmitted for publication.

8th.—That the Council consist of a President and —— Members, to be selected from the principal provincial towns. The Council, with whom must rest the chief responsibility of publication, to have full power of deciding on all papers transmitted; and the consent of three of its Members must be obtained before any paper can be published. It shall also be the duty of the Council to receive the subscriptions, when due, in their respective districts.

9th.—That the President of the Council be also the Treasurer of the Association, and keep the financial accounts.

REGULATIONS OF THE DISTRICT BRANCHES.

10th.—That Members of the Association be at liberty to form District Branches wherever it may suit their convenience.

11th.—That in order to facilitate the formation of such Branches, and maintain uniformity amongst them, the General Council provide suitable instructions for the guidance of those who may unite in instituting them.

12th.—That conformity with these instructions be further ensured, by the initiating proceedings and organization of each Branch being submitted to the General Council for their revision and approval.

13th.—That the District Branches be free to govern themselves as their respective Members may think fit; but that the by-laws ordaining the special government be submitted to the General Council previously to their taking effect, in order to guard against the possibility of any such by-laws contravening the fundamental laws of the Association.

14th.—That all Members appointed to offices by the District Branches be forthwith enrolled as Members of the General Council, on the appointments being officially notified to the General Council, it being highly expedient that all who engage in the executive management of the District Branches should be also Members of the General Council.

15th.—That the expenses incurred by the District Secretaries in conducting the proceedings of the District Branches be defrayed from the general fund, provided such expenses do not, in any instance, exceed one-seventh part of the guinea subscribed by each Member enrolled in the District Branch.

16th.—That if any circumstance arise in the formation of District Branches which calls for a larger expenditure than what is allowed by the foregoing resolution, such expenses, provided they do not exceed one-fourth of the guinea, may be allowed, by a statement of the circumstances being made known to the General Council.

ELECTION OF MEMBERS, ANNUAL MEETINGS, &c.

17th.—That each Member, on applying for admission, be nominated by two Members, as a pledge of eligibility.

18th.—That at each Annual Meeting the place of meeting for the ensuing year shall be announced.

19th.—That any Member wishing to propose a new law, or an alteration in an existing law, must send notice of his intention to the Secretary or Secretaries three months previous to the Anniversary Meeting, which will be circulated with the Report of the Council.

20th.—That the Association appoint Honorary Members at the Anniversary Meetings only.

21st.—That the Association appoint Members in foreign countries, to be styled "Honorary Corresponding Members," from whom communications, respecting the state of medicine in those countries, is expected to be received.

BENEVOLENT FUND.

22nd.—That a Medical Benevolent Society, under the restrictions proposed in the Report of the Committee presented to the Anniversary Meeting at Oxford, be connected with the Association.

PAYMENT OF SUBSCRIPTIONS, &c.

23rd.—Each Member of the Association to pay one guinea admission, and the same amount annually afterwards; the subscription to commence from the 1st of January each year, and to be considered as due, unless notice of its being withdrawn be given to the Secretary or Secretaries antecedently to the year for which it would be payable; for such subscription each Member shall receive a copy of each part of the *Transactions* published, which shall contain a list of all the Members, and be entitled also to a weekly copy of the *Provincial Medical and Surgical Journal.*

24th.—That those Members who have not an opportunity of paying their subscriptions to a Member of the Council resident in their district, are requested to pay it through the medium of their own bankers, to Messrs. Robarts and Co., London, for Messrs. Berwick and Co., Worcester, to the credit of the Association, or by a Post-office Order, sent to the President of the Council or the Secretary, which mode of remittance is specially pointed out, from being found the most convenient in conducting the business of the Society.

25th.—That all Papers and other communications be addressed to the Secretary or Secretaries, at Worcester, and forwarded carriage free.

26th.—That Messrs. Berwick and Co., Old Bank, Worcester, be the Bankers of the Association.

ROBERT J. N. STREETEN, SECRETARY.

RULES

OF THE

BENEVOLENT FUND

OF THE

PROVINCIAL

MEDICAL AND SURGICAL ASSOCIATION.

Before specifying the Rules which are to direct the proceedings of this Society, it is proper to repeat, in this place, the main principles on which it is established. It is not intended either to be a Benefit Society, or an Assurance Club; but, strictly speaking, a benevolent or charitable institution, founded and promoted for the express purpose of assisting our professional brethren, when struggling under the pressure of disease or other calamities. It is likewise proposed, under circumstances of peculiar urgency and distress, to administer relief to the widow or family of a professional man, who may have been deprived of the support and protection of a husband or parent. While, therefore, the sole design of this society is to hold out the hand of charity and benevolence to a suffering and afflicted brother, or his family, it will not countenance improvidence or idleness, or evil habits of any kind.

The principle above stated has received the sanction of three successive meetings of the Provincial Medical and Surgical Association; and the following Resolutions were finally adopted at the anniversary, held at Manchester on the 20th and 21st of July, 1836:—

1. That a charitable fund be created by donations and subscriptions of members of the Association, to be called "The Benevolent Fund of the Provincial Medical and Surgical Association."

2. That contributions be received from all persons friendly to the objects of the Society, though belonging neither to the Association, nor to the profession.

3. That the object of the fund be the relief of medical men* under severe and urgent distress, occasioned by sickness, accident, or any other calamity.

4. That any medical man labouring under such afflictions, be considered a fit object for the charity.

5. That the claims of contributors shall, as far as possible, have the preference; but that contributions to the fund give no claim of right to relief, the fund being one of pure charity, and that each case be judged according to the urgency of the distress.

6. That under circumstances of pecular emergency, relief may be extended to the widows and orphans of medical men, it being understood that it is not the design of this fund to relieve medical men from the necessity of providing for their families by ordinary life insurances, and such other means as prudence dictates.

7. That the management of the fund be conducted by Committees of the contributing members, annually appointed; the Central Committee to be at Cheltenham, and Local Committees, subordinate to the Central, in each of the principal cities and towns—the Central Committee having power to appoint Local Committees, wherever they may be required.

All communications to the Central Committee to be addressed to the treasurer and secretary, Dr. Conolly, Castleton House, near Cheltenham.

* The Society will not acknowledge any one as a fit object of relief who has not received a regular professional education, and is either a Doctor of Physic, or a Member of the College of Surgeons, or of the Apothecaries' Company.

NOTICES.

All Papers, and other Communications, to be addressed to the Secretary, Dr. Streeten, Worcester, and forwarded carriage free.

Those Members who have not an opportunity of paying their Subscription, which becomes due on the first of January in each year, to a Member of the Council resident in their district, are requested to pay it through the medium of their own Bankers, to Messrs. Robarts and Co., London, for Messrs. Berwick and Co., Worcester, on account of the "Provincial Medical and Surgical Association;" or they may remit the amount through the Post-office to either the President of the Council or the Secretary.

Gentlemen wishing to join the Association, are respectfully requested to apply to some Member of the Council in their immediate district; to Dr. Hastings, President of the Council, or to Dr. Streeten, Secretary, Worcester.

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From the Eleventh Volume of the "Transactions of the Provincial Medical and Surgical Association."

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Worcester District Medical Society.

REGULATIONS OF THE LIBRARY.

1st. Members of the Society may, on personal or written application to the Librarian, or to any person duly authorized by him, draw from the Library three volumes, but no more at any one time.

2nd. Any Member may retain any book four months, or from one stated meeting to the next, after the expiration of which time, if he neglect to return it, he shall pay a fine of ten cents per week on each volume so retained, and be deprived of further use of the Library until he shall have complied with this by-law; and if any member shall injure or lose a book in his possession he shall pay such sum as the Librarian shall estimate the damage to be, or he shall replace it by a new copy of the same.

3d. *Periodicals not bound* shall be subject to the following rules:—Each number of a semi-monthly or monthly may be retained ten days, and of a quarterly fifteen days; and the fine for longer detention shall be the same as for detention of books.

4th. Works of reference and valuable books with plates may be withheld from circulation at the discretion of the Library Committee.